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A. C. TRUE, Director.

**Irrigation Investigations, Elwood Mead, Expert in Charge.**

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IRRIGATION FROM THE SAN JOAQUIN RIVER.

BY

FRANK SOULÉ,

*Professor of Civil Engineering in the University of California.*

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[Reprinted from U. S. Department of Agriculture, Office of Experiment Stations Bulletin 100,  
Report of Irrigation Investigations in California.]

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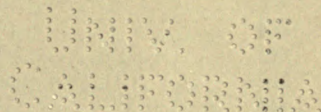
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# IRRIGATION FROM THE SAN JOAQUIN RIVER.

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## INTRODUCTION.

It is now admitted by practically all intelligent citizens of California who have considered the matter that the subject of irrigation is the most important one ever brought forward for the consideration of all our people. They acknowledge, as a vital fact, that upon the complete development of her agricultural and horticultural capabilities must be founded her greatest and most enduring prosperity. The discovery of gold or petroleum may give to a State a feverish or fitful impetus; but her permanent position must ever be dependent upon the character and quantity of the products of her soil and her facilities for obtaining for them a good market. And when, as in every arid or semiarid region, the character and quantity of the soil products are directly dependent upon the application of water by irrigation, the development and conservation of the supply of this water is a vital consideration. As the water supply is found in the streams, they must be skillfully husbanded, and the forests, their birthplace, carefully preserved, if the lands cultivated are to attain their possible fertility and productiveness.

The forests and waters once conserved, both should be administered in the manner contributing in the greatest degree to the benefit of all; which is simply saying in the wisest and most economical manner. In California, as elsewhere, the projector of an irrigation enterprise should be made to feel secure in the possession of his water rights previous to expending his energies and fortune in such system. He should be able to hold as certain title to the use of the water for a beneficial purpose as is held to the land or property on which the water is used. Any doubt or uncertainty on this point affecting either jeopardizes both, for in many cases without water the land is worthless. If a capitalist believes that in embarking upon an irrigation venture he is buying a tedious and expensive lawsuit he is likely to seek other investment for his capital; and if a farmer be sure that every attempt to bring water upon his land will be met by some obscure claim of previous appropriation or ownership he will probably purchase a farm in some other locality.

In California, unfortunately, by a legal "tide-rip" between the riparian principle, brought over with the common law of England, and the right of appropriation of water established by our gold seekers and afterwards embodied in the civil code of our State, a stream of litigation, tempestuous and baffling to enterprise, was injected into our irrigation sea, bringing to the surface a great mass of very unpleasant matter.

That this condition of irrigation affairs should be reformed is the sincere wish of every thinking citizen of our State. With a code of water laws based upon fairness and justice to all, and an administration of them seeking the greatest good to the greatest number, not only would the irrigated districts but the whole State bound forward in a career of prosperity.

#### **A BRIEF HISTORY OF THE DEVELOPMENT OF IRRIGATION IN CALIFORNIA AND IN THE SAN JOAQUIN VALLEY.**

The problems to be discussed in this paper are those relating to irrigation from San Joaquin River and its tributaries. It seems best, before turning directly to them, to give a brief history of the development of irrigation in California and more particularly, in the San Joaquin Valley.

California, at first possessed by Spain and afterwards by Mexico, derived its earliest ideas and methods of irrigation from those countries. The first irrigation in the State was practiced by the Spanish mission fathers, who, while converting to Christianity and civilizing the Indians, planted and cultivated vineyards, orchards, and farms surrounding the missions. The methods of irrigation in Spain were peculiarly applicable to the coast region and interior valleys of California because of the similarity of natural conditions in the two countries.

Until the coming of the Americans the water laws of California were those of Mexico and Spain. Under them the waters of the stream were held to be a public trust, title to which could not be granted to any private person or corporation. Permission for use only could be given, and then to the actual user and to the amount used. Upon the discovery of gold in California in 1848 the miners took water from the streams to wash the golden sands, and established local laws dictated by common sense and the interests of their industry. As indicating their righteousness, it may be said that they were practically the same in all mining districts, however widely separated.

As time went on California, which had been at first almost exclusively a mining State, became a great agricultural one. Its valleys and hill slopes produced immense quantities of wheat and other cereals, and spots favored by nature were converted into wonderfully productive orchards and vineyards. Wherever within her boundaries the rainfall was ample and reliable crops were good, both in quality and quantity; but in many localities where the soil and sun were friendly the rainfall was uncertain and often deficient. Settlers in many cases realized the importance, and often the absolute necessity, of the artificial use of water upon their farms in order to secure crops and a livelihood.

The first attempts of the American farmer at irrigation resulted in works of the most primitive character. Often individual effort led to the introduction upon the land, through a plow furrow, of a small quantity of water from a neighboring stream. Later, communities of farmers cooperated and constructed irrigation canals, to be utilized in common. At first, of course, the water most readily obtained was made use of, and for a time only small, cheap systems were constructed, and elementary irrigation practiced.

As districts became more populous and the necessity for water greater, individual effort, and even local cooperation, became insufficient, both as to methods and



capital, to supply the demand for water, and more costly and complicated irrigation systems were found to be necessary. Consequently stock companies were formed, and large amounts of capital enlisted in irrigation enterprises. In this way most of the waters flowing in the streams were "taken up" or "appropriated," and the importance of storage of the flood waters to meet the growing need became evident.

The development of stock companies and corporations soon grew to such proportions that a new danger became apparent. A monopoly of the waters available for irrigation was threatened. Great systems, involving the expenditure of hundreds of thousands of dollars or even millions, were practically absorbing all sources of water for irrigation. The farmers found themselves at the mercy of water companies, both as to rates charged and quantities of water applied; and the life and growth of agricultural communities were considered in jeopardy. This condition of affairs resulted in the evolution of the Wright irrigation law.

This law seeks to establish a system by which the people of any locality, the lands of which are capable of irrigation from a common source, may form an irrigation district on a basis somewhat similar to that of a municipal corporation. The effects of this law on irrigation in California and the litigation arising under it will be discussed later on.

During all this time the advantage of irrigation was becoming more firmly impressed upon California farmers and orchardists. With numerous excellent object lessons before them, they abandoned the prejudices formerly held against it and the expense and labor it involves, and have come to recognize in it an insurance not only of a crop but of vastly increased production from the same fields and, perhaps, of several harvests in a single year. As a result, from the more arid districts of southern California, where it naturally began, irrigation has spread rapidly over the State to its northern boundaries, and even over localities which are credited with reasonable rainfall.

Following closely in the path of such enterprise has come a wonderful increase in the variety and yields of crops, in population and in wealth. Raisins, wines, citrus, and other fruits have supplanted pastures, wheat, and barley; cities and towns stand on the ground of the old lonely farmhouse; and millions in bank are substituted for the "promise to pay" of unfortunate farmers. As an example of this wonderful increase in population, I will mention only seven of the many counties practicing irrigation, viz: Los Angeles, San Diego, San Bernardino, Kern, Tulare, Fresno, and Merced. In 1870 their total population was 40,849, and their combined wealth \$22,513,820. In 1890 their population had increased to 296,719, and their wealth to \$198,356,127; or the population had multiplied more than sevenfold and the wealth ninefold.

In contrast to these improved districts are those which have persistently resisted irrigation. They have not advanced. Often they have gone backward; and have retrograded in population and in wealth.

The writer believes that the prominence which California enjoys is largely due to irrigation; and that since the subsidence of the gold fever her progress and prosperity have been coincident with the production of the great variety and quantity of her crops resulting from the wise and skillful irrigation of her soil.

Turning now to the San Joaquin Valley, we find that Fresno County, in the center

of the San Joaquin Valley, is, perhaps, one of the best illustrations in California of the benefits of irrigation and of the transformation which may be wrought by the wise and liberal use of water in irrigation. In 1871 a colony was established in that county which cultivated and irrigated vineyards, producing raisin grapes. Since that time the population has increased from a few hundreds to over 100,000 people, and now some of the most beautiful and productive orchards and vineyards in the whole State are to be found in that portion of the valley. More than twenty colonies have been established in the same locality, and nearly twenty main irrigation canals, having a length of about 800 miles have been constructed. Their branches have an aggregate length of about 2,000 miles. In this county alone nearly half a million acres are under cultivation; and this great area, which formerly was capable of producing only sparse crops of wheat, or pasturage for cattle, now markets immense crops of raisins, cereals, and alfalfa. The lands which formerly were of little value, are now, when irrigated, worth from \$300 to \$1,000 per acre. And like results in a measure have been obtained in every district in the San Joaquin Valley where ample and intelligent irrigation has been practiced.

From this small beginning has grown up a great system of canals in the San Joaquin Valley. Those drawing their waters from the San Joaquin River are the Aliso, Chowchilla, Blyth, and East Side canals, on the right, or easterly bank; and the James, the San Joaquin and Kings River Canal and Irrigation Company's canals, and the system belonging to Miller & Lux, on the left, or westerly bank.

Taking water from the Fresno River, one of the most important branches of the San Joaquin in the contiguous district, are the canals of the Madera Canal and Irrigation Company; and in the same section of the valley, the Sierra Vista Vineyard Company and the Bliss Canal draw their supplies from Chowchilla Creek, another tributary of the main river.

## PHYSICAL FEATURES OF THE SAN JOAQUIN VALLEY.

### THE SAN JOAQUIN RIVER.

The waters of San Joaquin River are the union of the streams from many creeks and branches in the high Sierras, fed by the rain and melting snow that fall upon a mountainous drainage area of 1,637 square miles. The summit range of the Sierra Nevada is the eastern boundary of this area, which extends northerly and southerly for more than 70 miles. The river flows down through a steep, rugged canyon, in a westerly direction, to its point of debouchment upon the open country at Pollasky (formerly Hamptonville), 27 miles northeast from Fresno. From this point it continues in a southwesterly direction for 55 miles to the trough of the San Joaquin Valley. Here it unites with the waters of Fresno Slough in a swampy region subject to overflow and turns sharply to the northwest. From this junction on to its mouth, near Antioch, a distance of 120 miles, it is the main river of the great valley, and receives the drainage of the latter from all the streams on either side. These are numerous, and some of them on the eastern flank of the valley, deriving their waters principally from the Sierra Nevada's rains and snows, are considerable in volume.

As a rule, these tributary streams from the Sierras lying north of the Upper San Joaquin run in deep beds for many miles below their exit from the mountains,



and come to the level of the great plain only when nearing the trough of the valley. At this point in their course they turn northward and unite with the main stream—some as distinct branches; others, as in the case of the smaller ones, through swamps, sand-flat deltas, or overflowed tracts.

Those named below are the principal streams flowing down the east side of the valley, as enumerated from the northerly end, with the drainage area of each given. The streams marked with an asterisk derive their waters largely from the melting snows of the high Sierras. These snows are substitutes for extensive storage reservoirs, and slowly yield their waters throughout our early springs and summers—the irrigation season—in an unfailing supply of irrigation water. The remaining streams of the list have their sources in the nearer mountains and foothills, and are replenished by rains rather than by melting snows, and in consequence are torrential in character, intermittent in flow, and less reliable for purposes of irrigation.

*Tributaries of the San Joaquin River, with their drainage areas.*

|   | Square miles. |
|---|---------------|
| Consumne River* .....                         | 589           |
| Dry Creek.....                                | 208           |
| Mokelumne River* .....                        | 573           |
| Calaveras River* .....                        | 390           |
| Stanislaus River* .....                       | 971           |
| Tuolumne River*.....                          | 1,514         |
| Merced River* .....                           | 1,072         |
| Bear Creek.....                               | 153           |
| Mariposa Creek.....                           | 96            |
| Chowchilla Creek (or river).....              | 272           |
| Fresno Creek (or river) .....                 | 258           |
| San Joaquin River*.....                       | 1,637         |
| Kings River*.....                             | 1,853         |
| Keweah River.....                             | 608           |
| Tule River .....                              | 446           |
| Deer Creek.....                               | 130           |
| White River.....                              | 96            |
| Posa Creek .....                              | 278           |
| Kern River* .....                             | 2,382         |
| Caliente Creek.....                           | 461           |
| Numerous small streams.....                   | 2,138         |
| Total area of mountain and hill drainage..... | 16,135        |

On the western slope of the San Joaquin Valley the streams originate in the Coast Range of mountains. They are torrential and intermittent in character. The stream beds carry water but a few hours or days after rainfall, and this water spreads over the upper plain, seldom reaching the San Joaquin. The streams are limited in supply and unreliable for irrigation.<sup>1</sup>

From Pollasky for a distance of 40 miles downstream the river winds along through low, fertile, and productive bottoms, shut in by bluffs, with hills behind them. The river gorge in this length varies from a mile to a half mile in width. Behind the bluffs and hills are elevated plains. These bluffs diminish in height above the river from 75 feet near Pollasky to 40 feet at Herndon, and finally disappear at

<sup>1</sup> William Hammond Hall.

a distance of 20 miles from that place, where the river runs into the Fresno Swamp delta.

The entire face of the valley trough surrounding the Fresno Swamp and the great bend of the San Joaquin River is often submerged during the floods, and below this region numerous sloughs break out from the San Joaquin, and, after running for a distance in the same general direction, reunite with it lower down, thus forming a broad, swampy area, often submerged and generally very fertile.

From Pollasky the river flows over alternating beds of disintegrating granite, interspersed with bowlders and coarse gravel and broad, flat bars of sand. Its channel varies in width from 300 to 900 feet, and also greatly according to the stage of the river. Its descent from Pollasky to the lower plains below Herndon is quite rapid, being more than 80 feet in the 20 miles. From this point its fall is naturally more gradual as it passes out upon the nearly level plains, being only 36 feet to its union with the waters of Fresno Slough, 36 miles farther down.

In its course through the valley trough the descent of the river is still more gradual, and in times of low water it winds along around sand bars in its bed or bordering its banks. For example, the straight line from the junction of the river with Fresno Slough to the head of Old River, where it separates into two channels, is 87 miles in length, but the river between those points develops into 146 miles. Its average width in this stretch is from 300 to 600 feet, and its depth from bank top to bed is 12 to 18 feet.

The river bed is usually covered with clean siliceous sand, with here and there an outcropping of tenacious clay. The banks are generally of a tough alluvial deposit, and, as usual with streams subject to floods, are slightly higher than the lands outside of them.

The course of the river, and of each of the many sloughs which drain into it, may be followed by the thick, luxuriant growth of swamp willows which lines their banks. On the higher ground cottonwoods flourish, and oaks are scattered at intervals over the entire district.

As may be readily understood, the high, steep bluffs on either side of the upper reaches of the river have offered great engineering obstacles to the diversion of water for the purposes of irrigation, and but one attempt to this end (which resulted in disastrous failure) has been made—that by the Upper San Joaquin River Canal Company.

The first feasible point along the river from which water may be easily taken for irrigation without the building of a long line of canal above the irrigable district is about 40 miles below Pollasky, where the Aliso Canal diverts water from the river. From this point down, on each side of the river, the high banks and the relatively low plain beyond make the construction of irrigating canals easy; and it is from this point on that we find in successful operation the systems of canals deriving their water from this river.

#### THE SOILS IN THE DRAINAGE AREA OF SAN JOAQUIN RIVER.

After the river leaves the mountains, as before described, the surface of the land is at first interspersed with outcroppings of primitive rock. The soil is thin and yields only scant pasturage and is nowhere much above hardpan or bed rock. An



exception to the above condition is found in the bottom lands of the river from Polasky downstream. These are composed of loose sand washings and river sediment, mixed with clay loam; are fertile, readily absorb water, and are easily irrigated.

As we proceed southward and westward along the river the rolling lands on either side are lean, compact, dry reddish clay and igneous mud deposits, with "hog wallow" formations prominently in evidence. The hardpan approaches close to the surface and is sometimes bare. The soil is so puddled by the clay ingredients that it is almost nonabsorbent of water; and irrigation, particularly by means of lateral absorption and subirrigation, is almost impossible. Some of these lands are summer fallowed, and thus are made to produce fair crops of cereals.

As we move farther in a southwesterly direction into the plain and irrigation sphere of Kings River we find the soil deep, absorbent of water, and remarkably well adapted to the best methods of using water and to the production of heavy crops.

This character of soil holds except within a strip a few miles in width south of the San Joaquin. On the north bank of that river the "hog wallows" and rolling lands run far down into the valley, and owing to their nonabsorbent character the country is difficult to irrigate, except in small areas here and there where alluvial deposits are found. This condition prevails until the middle plain is attained. There the high river banks and hills are left behind; the plain is only 40 or 50 feet above the river bed, and the soils on either side are looser, lighter, and better adapted to irrigation. On the south side they are deep, sandy, and nearly free from alkali. On the north side they are not as light, with the exception of the alluvial spots before mentioned. The surface is somewhat rolling, and often contains spots of alkaline soil. The depth to hardpan is not great, and altogether the soil is not as fertile nor as easily cultivated and irrigated as on the south side of the river in Kings River domain.

As we proceed toward the lower plain and the trough of the San Joaquin we encounter soils varied in constitution in different localities, often changing quickly within limited areas, being sometimes black adobe, then loose, sandy loam and river sediment, and again hard, alkali soil and compact hardened clay loam.

The lowest valley trough is subject to occasional overflow from the river, and in some parts to annual inundation.

Dr. E. W. Hilgard, professor of agriculture in the University of California, says of the soils of the San Joaquin Valley.<sup>1</sup>

The higher plains have very uniformly, from Kern County to Stanislaus, a very sandy loam soil of great depth, and almost everywhere made of granite débris instead of quartz grains; hence, continually increasing their stores of mineral plant food by the weathering of the minerals present, a process which in so porous a material, subject, in its natural condition, to the free access of air during the greater part of the season, was evidently very rapid and as a consequence has developed unusually large amounts of the soluble products, which often appear in an inconvenient abundance in the guise of alkali. But little trouble arises from this cause in the high-lying sandy tracts, where irrigation or the natural rainfall carries the soluble salts annually into the country drainage. But in the low-lying and less pervious soils of swales and valley troughs, which are at the same time intrinsically the richest in available mineral plant food, the accumulation frequently causes considerable trouble and difficulty. There is on the whole, however, but little of the heavier class of adobe soils to be found in the San Joaquin Valley; what is currently so designated would in other regions sometimes be hardly classed as

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<sup>1</sup> California Station Rpt. 1888-89, pp. 115, 130.

a clay loam. The narrow belt of dark-colored clay, or adobe land, extends from the neighborhood of Merced City toward Stockton, where, northward of French Camp Slough and especially westward to the Coast Range, really heavy adobe, or prairie soils, prevail very largely. To the southward of the line of San Joaquin County adobe soils are found only in the river trough, and the soils of the west side are prevalently sandy all the way to the Tejon Mountains. \* \* \*

The ancient deposits of the Kings River are represented by the "white ash" soils of the Central, Washington, and other colonies; while those of the San Joaquin side are reddish, sandy loams, contrasting pointedly with the "white ash" lands. This distinction is said to be maintained to a greater or less extent nearly to the trough or edge of the "tule" belt to the westward; while to the eastward of Fresno City both kinds of lands run out, as the foothills are approached, into a border belt of brownish clay loam (here also called adobe). \* \* \*

The magnificent results of irrigation in the Fresno region, transforming what seemed an arid waste into a maze of orchards, vineyards, and fields, showing the most luxuriant growth of a great variety of products of the warm, temperate zone, can not readily be excelled as a cogent illustration of the benefits of irrigation in all its phases. Owing to the porous nature of most of its soils, and the fact that certain portions of the region are underlaid by more or less compact and impervious calcareous hardpan, it has also served conspicuously, in times past, to illustrate the evils of overirrigation, resulting in the temporary "swamping" of lower lying lands and the development of alkali where it was never known before, and need not be hereafter under a rational system of drainage.

In the lower lands of the country to the northward, to the Fresno plateau, on the San Joaquin and Fresno rivers, as well as on Cottonwood Creek, we again find soils of a heavier grade, and with large supplies of mineral plant food.

#### RAINFALL.

Stated roughly and in round numbers, the annual precipitation of rain and snow on the high Sierras at the sources of San Joaquin River has a mean of 50 inches. In the lower mountains of its watershed the amount falls to 40 inches; on the foothills to 30; upon the higher plain to 20; and in the lowland trough of the river, at and near its great turn to the north, to 10 inches; from which locality it gradually increases in amount as we proceed down the valley to the mouth of the river.

#### FLOW OF THE RIVER.

The San Joaquin fluctuates widely in the course of the year, between a high or flood water level and a low or autumn flow. By gagings at Hamptonville (or Polasky) and also at Herndon, the maximum flow of the river has been recorded as high as 59,800 cubic feet per second. The months of greatest flow are from January to July, inclusive. On the other hand, its minimum flow has fallen as low as 150 feet at Herndon. The months from August to October include the period of low water. In the winter and spring months the average discharge approximates to 5,000 to 6,000 cubic feet per second.

#### CLIMATE.

That part of the great interior valley drained by San Joaquin River contains 11,000 square miles. Its climate is quite different from that of the coast regions on the west, as well as from that of the high Sierras on the east. The annual rainfall is light, decreasing gradually from an average of about 12 inches in the lower valley near Stockton, to about 5 inches in the upper part near Bakersfield, approximately 225 miles distant.

Its atmosphere is very dry, particularly during the summer season; and consequently very conducive to the evaporation of water, both from the streams and the soil. The summer temperature is very high, but, owing to the dryness of the



air, is not often oppressive or injurious to the health. In the winter season there is little or no destructive frost, and except in the mountainous districts, no large amount of ice or snow. The summer nights are usually clear, and owing to the uninterrupted radiation of heat and the descent of cold air from the Sierras, are cool and comfortable.

The prevailing winds in the valley are from the north, being in summer time the sea breezes of the coast that follow the river and lowland levels, and which come in a dried and tempered condition to the interior valley. In both summer and winter the valley is occasionally visited by "northers" or high north winds, which blow with considerable velocity. Those of summer carry great volumes of desiccated air over the entire region, abstracting moisture from the soil and vegetation and evaporating immense quantities of water from canals and streams. The winter "northers" are usually cold, and frequently are dry, also.

The rain is usually brought by a warm southerly wind, and is seldom large in amount.

#### PRODUCTS.

Originally the great San Joaquin Valley was almost entirely cultivated for enormous crops of wheat, the farmers relying upon winter rains for the natural irrigation of the soil, or on summer fallowing to eke out the scanty rainfall. On the west side of the valley the precipitation is often deficient, no more than two or three crops of grain in five years being probable without artificial wetting of the soil.

As irrigation came to be practiced the waters of the San Joaquin and of the other rivers in the great valley were carried upon the fertile lands in the valley trough, and heavy and remunerative crops of raisin and wine grapes, orchard fruits, alfalfa, and the cereals were produced, as well as good pastures for immense herds of cattle; and it soon became evident that much of the valley land upon which irrigation water could easily and cheaply be introduced was too valuable for the production of ordinary and single crops of wheat or other grain. Consequently such areas were speedily converted into orchards and vineyards or into alfalfa fields from which three to five crops of the rich grass could be harvested each year.

#### IRRIGATED TRACTS IN THE VALLEY AND POSSIBLE EXTENSIONS.

The Aliso Canal, highest up on San Joaquin River on its right or easterly bank, and owned by Miller & Lux, a corporation, was constructed and is used for the purpose of irrigating wild grass lands in the river bottom of that locality. It improves the pasturage for herds of cattle belonging to the corporation and it irrigates an area of about 3,000 acres. Miller & Lux intend to further extend this irrigation.

Next below Aliso, on the same bank, is the Chowchilla Canal, belonging to the California Pastoral and Agricultural Company. It was constructed to irrigate the lands of the great Chowchilla Ranch, containing 107,000 acres. This ranch is mainly utilized for the pasturage of cattle and the raising of swine, but 3,300 acres of it are cultivated for alfalfa, 600 acres for barley, and 480 acres for grass. Much of the land in the Chowchilla Ranch is unfertile; nevertheless, with a large supply of water a greater area could be irrigated and improved. This supply, however, can hardly be obtained except by using a portion of the flood flow of the river, either by means

of storage or irrigation in the high-water season. The benefit of irrigation in this region is shown by the well-known fact that irrigated lands are worth, on the average, at least twenty-five times the value of those in the same locality which remain unirrigated.

Some miles below the Chowchilla Canal, on the same bank and belonging to the same company, is the Blyth Canal, recently constructed for irrigating the wild grass lands on the Chowchilla Ranch. It is a short canal, 0.75 of a mile in length, and introduces water into the dry bed of the Fresno River, from which the water spreads out upon the adjacent plain and irrigates 9,000 acres of land. With a sufficient water supply this area could be largely extended or increased.

Still farther down on the right bank of the San Joaquin is the East Side Canal, sometimes called the Stevenson-Mitchell Canal, which irrigates 2,500 acres of land, distributed as to crops as follows: Alfalfa, 1,000 acres; barley, 300 acres; wheat, 100 acres; "hog corn," 100 acres; pastures and wild grasses, 1,000 acres. Much more land in the vicinity might be irrigated with a greater water supply; but no storage reservoirs are possible in this locality, and only by winter and spring flooding of the lands and storage of water could the irrigated areas be increased.

On the westerly or left bank of the San Joaquin we find, first, the James Canal, formerly known as the Enterprise Canal. It is owned by the James Canal Company, which possesses a large ranch of 65,000 acres, lying in the angle between San Joaquin River and Fresno Slough, and south and west of the latter. The company proposes to irrigate nearly the whole of this tract, either for pasture lands or for the production of alfalfa or cereals. Thus far, 42,650 acres have been irrigated from the canal; but at present its operation is enjoined by the superior court of Fresno County as the result of a suit brought against the company by Miller & Lux. The details of the litigation will be given hereafter.

Next on the river, below the James Canal, is the largest, most complex and extensive system taking water from the San Joaquin. It is known as the San Joaquin and Kings River Canal and Irrigation Company. Miller & Lux, a corporation, are the principal stockholders in this company. It owns the "Main" or "Old Canal," the China Slough, and Outside Canal, which form one line; the Parallel Canal and the Dos Palos Canal, with numerous branches. In addition to these, Miller & Lux own independently Poso Slough, Temple Slough, and Santa Rita Canal, which are used only to irrigate ranches belonging to that corporation. More than 100,000 acre of land have been, at one time or another, irrigated by this entire system, and in each year, on the average, about 50,000 acres are thus prepared for crops of alfalfa, cereals, or fruits. In addition to this must be mentioned the immense but indefinite areas of wild grass lands belonging to Miller & Lux, which are flooded by the high waters of the river taken in through Poso and Temple sloughs, and which furnish pasturage for cattle, bred and raised for the supply of the San Francisco market. With the present conditions of water supply it seems impracticable for this company and corporation to extend their irrigation systems very considerably, as they have no storage reservoirs, but rely upon the flow of San Joaquin River for the required amount of water. The length of their supply canals already reaches 87 miles, and these have branches amounting in all to over 200 miles in length. With an increased supply of water from storage this side of the valley, the west side plain, for a much greater distance



down toward the mouth of the river, might be successfully and profitably irrigated, and, in fact, the area of land under the ditches and the crops produced could undoubtedly be multiplied several times.

The irrigation possibilities of the river, so far as the ordinary flow is concerned, seem to have been fully exploited, and further extension of irrigated area will depend entirely upon the storage of storm and flood waters.

Irrigation along San Joaquin River is practiced both for the wetting of barley and alfalfa tracts, where the soil is too alkaline for the production of other crops, and for the cultivation of various cereals, grapes, and orchard fruits where the absence of alkali permits. It is also used to improve the pasturage on the wild grass lands in the river bottom.

This list includes all the irrigation systems taking water from San Joaquin River and the lands irrigable therefrom; but, as Fresno River and Chowchilla Creek are natural tributaries of the San Joaquin and are in close proximity to it, I shall include in this report descriptions of these streams and of the lands which may be irrigated from them.

#### FRESNO RIVER.

This river has a drainage area of 272 square miles. Its sources are in the lower mountains and foothills on the east side of the San Joaquin Valley; consequently it is fed principally by the rains which fall upon these elevated lands, and derives comparatively little of its water from melted snow; therefore, it is a torrential stream, subject to great and sudden floods, and afterwards usually quickly subsides into ordinary flow, or even a dry state. The months in which the greatest flow occurs are December to June, inclusive. During the remainder of the year its bed is nearly or quite dry.

Records available show a monthly mean flow sometimes as great as 1,632 cubic feet per second; but the general average is much lower than that, running from 200 to 500 cubic feet per second during the wet months.

The waters of this river, carried in the Madera Canal and Irrigation Company's ditches, are used first to irrigate alfalfa on from 100 to 300 acres of land on the Adobe Ranch, 10 miles above the town of Madera. This area could be increased, probably, to 1,000 acres, by a sufficient water supply. The main field of distribution from the canal is upon what was formerly known as the Howard & Wilson Colony lands, about a mile below or southwesterly from the town of Madera. About 40,000 acres of irrigable land lie under the ditches of this company, of which one-half have been irrigated at different times. The maximum area irrigated in any one year has been 14,000 acres. During last year—1899-1900—the company watered 7,100 acres. As the water supply for this canal is limited, the irrigated area depends largely upon the amount of the rainfall and the resulting quantity of water flowing in the river. With ample storage capacity, the entire 40,000 acres of land might easily be irrigated, and to great advantage. In fact, there is a very large area of land lying beyond this colony, to the south and west, which might easily be brought under the ditches, if water were available. This company is already preparing to improve its canal system and to greatly increase its storage power. The particular crops produced in 1899-1900 were: Wheat, 300 acres; barley, 600 acres; grass and alfalfa, 3,000 acres; vineyards, 2,000 acres; orchard trees, 1,000 acres; Egyptian corn, 200 acres.

### CHOWCHILLA CREEK.

Chowchilla Creek is similar in origin and characteristics to Fresno River, already described. It has a drainage area of 268 square miles, and, like the Fresno, is subject to sudden freshets in the rainy season. Records have given it a mean monthly flow as high as 1,608 cubic feet per second, but its average during the months from December to July, inclusive, is far below that amount, being approximately 150 cubic feet per second. The months from February to June, inclusive, furnish the greatest flow, averaging 333 cubic feet per second; but the months from July to October, inclusive, ordinarily afford little or no water.

The only irrigation systems on Chowchilla Creek are those of the Sierra Vista Vineyard Company and the Bliss ditches. By means of dams across the bed of the creek they utilize the flow of the stream to irrigate some 6,000 or 8,000 acres of land lying on either side of the stream, upon which vineyards, fruit trees, alfalfa, and pasture lands are cultivated or improved. The area irrigated in any one year is largely dependent upon the rainfall and the resulting water supply in the creek. The irrigated area might be largely increased by multiplying the number of dams and thus establishing a series of impounding reservoirs in the bed of the stream. As it is, during freshets, much water must be turned aside into the beds of Berenda and Ash sloughs in order to avoid the destruction of the dams. Such new impounding dams should have stability sufficient to resist destruction by sudden floods and freshets. There are, also, one or two excellent reservoir sites in the mountains above Buchanan, where large quantities of water might be stored.

The valley lands adjacent to the San Joaquin and its branches, now being irrigated by existing canals, approximate 120,000 acres in cereals, fruits, and alfalfa, and the area of wild grass lands which are overflowed by the flood waters of the river is fully double this amount.

### ESTIMATE OF TOTAL AREA OF LAND WHICH MIGHT BE IRRIGATED FROM SAN JOAQUIN AND FRESNO RIVERS AND CHOWCHILLA CREEK.

In making this estimate I proceed on the assumption that the duty of water in this region, the valley trough, is approximately 160 acres per cubic foot per second. I assume this duty because no positive and definite information has been available as to the exact duty of water on the different irrigated areas investigated by me, but the general consensus of opinion among canal owners, ranch owners, and canal superintendents is that the above is a fair approximate average of the duty of water.

I find from Hall's tables of flow of water in San Joaquin River, established by gagings from 1878 to 1884, inclusive, that the average number of cubic feet per second for the period from November to January, inclusive, is 750, which, upon the assumption that a cubic foot per second will irrigate 160 acres of land, would, during this period, properly irrigate 120,000 acres of land if all the water flowing were available for irrigation. In the same way the average flow for the period from February to April, inclusive, being 2,462 cubic feet per second, would serve 393,920 acres; in the period from May to June, inclusive, the mean of about 7,458 cubic feet per second would irrigate 1,193,280 acres, and during August to October, inclusive, the 808 cubic feet per second, average mean flow, would irrigate 129,280 acres of land.



Under the supposition that this water could be stored and dealt out throughout the year as might be necessary, it would furnish 3,074 cubic feet per second, and would, according to my assumption, irrigate fully 490,000 acres, instead of 120,000 (omitting the wild grass lands, indefinite in extent) which are irrigated at the present time. In other words, more than four times the present irrigated area might be brought into the watered region with a corresponding increase in values and productiveness.

As the flow here given is only the average during six years, and is greatly in excess in some months and deficient in others, the necessity for ample storage is apparent.

The gagings of Fresno River for the same years show that in the period from November to January, inclusive, the average flow is 66 cubic feet per second, which, with a duty of 160 acres per cubic foot per second, would serve during this period 10,560 acres. In the interval from February to April, inclusive, the average flow is 482 cubic feet per second, which, on the same basis, would serve 77,120 acres. From May to June, inclusive, 127 cubic feet per second, the average flow, supposing all the water to be available, would provide for 20,320 acres. In the period from August to October, inclusive, the flow is given as 3 cubic feet per second, which would irrigate only 480 acres. In the same way, as before explained, if the entire flow of the river, which averages 160 cubic feet per second throughout the year, could be stored and dealt out as required it would provide for 25,600 acres, instead of the average of 10,000 acres, or an area over two and one-half times as great as is at present irrigated. As in the case of the San Joaquin, the necessity for ample storage is apparent. The irrigated region might well be extended in a direction southerly and westerly from the town of Madera.

The records of the flow of Chowchilla Creek during the years 1878 to 1884 give for the period from November to January, inclusive, a mean discharge of 44 cubic feet per second, which, on our assumption, should provide for 7,040 acres during that period. From February to April, inclusive, 456 cubic feet per second is the mean flow, which should provide for 72,960 acres. From May to June, inclusive, the mean flow of 118 cubic feet per second should provide for 18,880 acres, and from August to October, inclusive, 2 cubic feet per second would provide for only 320 acres. By storing and regulating the supply as before described, about 24,640 acres might be irrigated throughout the year instead of 5,000 or 6,000 acres during a few months of each year, as now.

At present much of the freshet water of the Chowchilla is lost to irrigation by being turned aside into Ash and Berenda and other sloughs in order to prevent the destruction of the dams yet remaining intact. The advantages of storage and continuous supply in these cases seem very evident, and as the soil and topography of these localities are peculiarly suited to irrigation the irrigable area might be largely increased, probably by 15,000 acres.

Under the assumption which I have made, it is possible to increase, through storage of flood waters, the irrigable lands on the streams mentioned, as follows:

*Possible extension of irrigated area under San Joaquin and Fresno rivers and Chowchilla Creek.*

| Stream.                 | Present area. | Possible area. |
|-------------------------|---------------|----------------|
|                         | <i>Acres.</i> | <i>Acres.</i>  |
| San Joaquin River ..... | 120,000       | 490,000        |
| Fresno River .....      | 10,000        | 25,600         |
| Chowchilla Creek .....  | 6,000         | 21,640         |
| Total .....             | 136,000       | 540,240        |

Of course, in this computation we have taken no account of the loss of water from percolation into the soil, or by evaporation in storage reservoirs; but this would be relatively small in amount.

### APPROPRIATION AND DISTRIBUTION OF WATER.

The right to the use of water from streams in California may inhere in the riparian proprietor or may be acquired by complying with the statutes of the State for the appropriation of water. Rights to water acquired under the civil, Spanish, or Mexican laws before California came under the control of the United States are guaranteed and protected to the fullest extent. Appropriations of water must be for a beneficial purpose.

The method of appropriating water as described in the statutes is as follows:

SEC. 1415. A person desiring to appropriate water must post a notice, in writing, in a conspicuous place at the point of intended diversion, stating therein:

(1) That he claims the water there flowing to the extent of (giving the number) inches measured under a 4-inch pressure.

(2) The purpose for which he claims it, and the place of intended use.

(3) The means by which he intends to divert it, and the size of the flume, ditch, pipe, or aqueduct in which he intends to divert it.

A copy of the notice must, within ten days after it is posted, be recorded in the office of the recorder of the county in which it is posted.

In order to determine the amount of water "filed on" and appropriated from San Joaquin River, Fresno River, and Chowchilla Creek, respectively, I studied the records of water claims filed in the offices of the county recorders of Fresno, Madera, and Merced counties, first having ascertained that those were the only counties in which water for irrigation was claimed by appropriators from these streams; and also made diligent inquiry among irrigators and old residents interested and well informed as to irrigation matters. I found filings on water made as far back as 1857. These very early claims were usually for water to be used in mining and milling ores, and were made at points in the mountainous regions around the sources of the San Joaquin. These early records were often very indefinite both as to the location of claims and the amount of water appropriated; but probably in the ordinary case the water claimed was, after use, turned back into the stream. It would have been practically impossible, however, at a later date for another person to decide upon either the validity of the claim or the locality in which it was made, owing to the looseness of the description.



In endeavoring to determine the amount of water appropriated on each of the streams under consideration, seven large volumes of water claims and one volume of the records of the board of supervisors of Fresno County had to be carefully gone over and, as far as possible, the streams, branches, tributaries, and claims identified. In many cases forks, branches, and small tributaries were mentioned and water claimed therefrom by persons whose names were unknown not only to the county recorder and his deputies, but to the county surveyor and his predecessors in office and even to the "oldest inhabitant" of the region supposed to be the locality specified. Again, in the wording of the claim no statement would be found as to whether the stream on which water was claimed was a tributary of the San Joaquin or of some other river, and since the filing of the claim the name of the stream might have been changed once, if not oftener. The miners and irrigators in the early days gave fanciful and arbitrary names to streams, gulches, and valleys, which later were changed and in time forgotten.

Another confusing feature was the fact that a great number of streams bore the same name, as, for instance, a great favorite, Whisky Creek, and also Jackass Creek, Bear Creek, Mill Creek, etc. Some of the streams bearing these names were tributaries of the San Joaquin and others of Kings River. It was necessary to look up on the map the section, township, and range in which the claim was located in order to decide whether the stream named was a tributary of the San Joaquin or of some other river. When, as was often the case, no section, township, or range was mentioned, it was practically impossible to locate the claim unless some natural object—such as a ranch, bridge, or abandoned mine—was mentioned which happened to be known by some person questioned by us. There were also numbers of claims on streams which had at one time or another been tributaries of the San Joaquin, but had since been diverted or had sunk into the sands to disappear before reaching the main stream. It was necessary to look up these streams and ascertain by inquiry whether any of their water, in times of flood, still reached the San Joaquin.

Many tributaries of this river on which claims were located did not appear at all on maps of the county, and could be "run down" only by close inquiry among miners, mountaineers, sheep men, and State forest or fish commissioners who were familiar with the ground. Some claims on Minaret Creek had eluded our closest scrutiny, and we had about decided to pass them as not belonging to the San Joaquin when fortunately we met a fish commissioner who knew the locality and was able to inform us that the creek in question was quite a bold stream and an undoubted tributary.

The ignorance of standards of measurement of flowing water, even in cases of corporations appropriating large amounts, was very evident and often disagreeably prominent. Square inches and square feet of water were often claimed, as well as "cubic inches" and "cubic feet" under a 4-inch pressure; and the powers of translation of the writer in endeavoring to interpret the real meaning of the appropriator were often severely taxed. Again, claims to immense quantities of water, ridiculously disproportionate to the means stated for diverting them, were a common feature; and claims to "all the waters in the river" or to millions of miner's inches were frequently encountered in the search of the records.

It was found to be practically impossible, except in the cases of the few existing

canals, to ascertain if the water claimed had ever been used. The writer can conceive of no more difficult task for the searcher of records than to trace and pass upon the validity of almost any of the older water claims filed in these counties during the last thirty years, naturally the result of the careless and indefinite statute prescribing the form and method of appropriation.

In order to more clearly show the looseness and indefiniteness in claiming water, I give herewith some extracts from the records in each of the three counties.

The following notice is an example of indefiniteness both as to quantity of water claimed and of the locality in which it is to be taken. It will be seen also that no mention is made of the point where the water is to be used:

*Mill Creek, a tributary of the North Fork of the San Joaquin. Dated June 20, 1878.*

I hereby give notice that I claim 2 feet of the waters of Mill Creek, same to be measured under 4-inch pressure. Said water to be used for irrigation purposes. Said water to be diverted by means of a ditch, to be taken out of said Mill Creek at a point about 10 yards above where the train from Ridenhars to Hurses crosses Mill Creek.

Another of these earlier claims is as follows:

*North Fork of the San Joaquin. Dated the 8th day of October, 1877.*

Know all men whom it may concern that I, ———, of the above-named State and county, have this 8th day of October, 1877, appropriated and claimed all the water for 1 mile below John Hern's mill, or to the extent of 5,000 cubic inches, measured under a 4-inch pressure, flowing into the North Fork of the San Joaquin River in Crane Valley, in said State and county, to be used as stock water and for agricultural purposes, to remain in its natural channel, along with the privilege of diverting 1,000 cubic inches, measured under a 4-inch pressure, from said North Fork, at any point most convenient, within any point from one-fourth to 1 mile below John Hern's mill, in said State and county and valley, to be conducted from said channel by ditch and flume of 3 feet wide and 2 feet deep.

Recorded 18th of October, 1877, in Book A of Water Rights Records of Fresno County, Cal., page 121.

*Fine Gold Gulch, a tributary of the San Joaquin. Dated 27th day of April, 1878.*

Notice is hereby given that we claim the waters of this stream and all its tributaries from this point up, to the amount of 5,000 cubic inches of water, measured under a 4-inch pressure, for mining purposes. The original of this notice is posted on a white-oak tree on the south bank of the north fork of the stream of water known as Fine Gold (Gulch?), about 3 miles northerly from the residence of J. B., in Fresno County, Cal., and is located this 27th day of April, A. D. 1878.

If all the tributaries of this stream are definitely known in position on the map and in the country, and we know exactly what appropriators mean by "cubic inches of water, measured under a 4-inch pressure;" and if there are no other white-oak trees in that vicinity; or if the white-oak tree has not been cut down, blown down by the wind, or struck by lightning; and if "3 miles northerly from the residence of J. B." means exactly 3 miles in exactly a north direction; and if J. B. has not moved away so long ago that he is forgotten, then we may regard this location as a very exact and definite one. But otherwise it would probably be very difficult to determine the point where this appropriation was made, with a view of ascertaining whether the water claimed was actually used. And if we could not interview the three appropriators, we might still be left in doubt as to the amount of water claimed.



*South branch of Kaiser Creek. Dated March 29, 1881.*

Notice of location: Notice is hereby given that we, the undersigned persons, claim 400 inches of the water of this creek, where this notice is posted, this creek being one of the south branches of the Kaiser Creek. The water is to be taken out where this notice is posted and conveyed in a flume and ditch to the side of the ridge next to Kaiser Creek, and used in hydraulic and "min." purposes, and returned to its original channel about 2 miles below.

Dated at Kaiser Creek, Fresno County, Cal., March 29, 1881.

V. B. C. claims "The water of the San Joaquin River \* \* \* to the extent of 51,840 cubic inches, under a 4-inch pressure."

*San Joaquin River. Dated October 20, 1887.*

*Notice.*—Notice is hereby given that we claim the waters of the San Joaquin River to the extent of a flow of 3,456,000 cubic inches under a pressure of 4 inches; that we intend to use said water for irrigation, navigation, domestic, and manufacturing purposes; that we intend to use said water on the east of the San Joaquin River and on the west of the foothills of the Sierra Nevada Mountains, and in the counties of Fresno, Merced, and Stanislaus; that the course of the canal will be easterly and northerly; that we intend to construct a canal of sufficient size and capacity, to be not less than 60 feet wide on the bottom, nor less than 75 feet wide on the top, and to be 7 feet deep, reckoning from the grade to the top of the embankment. (The point of diversion of said water is on the right or east bank of the San Joaquin River, at or near the end of a large slough, at or near where this notice is posted.)

Fresno County, October 29, 1887.

Recorded November 4, 1887, in Book B of Water Rights Records of Fresno County, Cal., pages 50-51.

A. B. and J. B. claimed "500 inches, miner's measurement, under a 4-inch pressure, or all of the waters of this Willow or North Fork Creek. \* \* \* The point at which we take the waters of said stream for the purposes aforesaid is about 20 feet in a southeasterly direction from a certain yellow-pine tree marked B. D., on the west bank of said stream, and on which this notice is posted, and about 14 feet in an easterly direction from a certain white live-oak tree, also marked B. D., on the west bank of said stream." \* \* \* It is hoped that these trees are not situated in the forest, and that they still remain standing, although probably the "B. D.'s" are now illegible.

Fifteen miners claim 250 feet of the water under a 4-inch pressure from the south branch of the South Fork of the San Joaquin. Probably they knew what they meant by 250 feet of water under a 4-inch pressure. But it is very doubtful if H. N. B. did know exactly what he meant by claiming "4 square feet of the water of Whisky Creek, measured under a 4-inch pressure."

On the Chowchilla Creek, 4,000 and 20,000 cubic inches, measured under a 4-inch pressure, are claimed.

The K. C. A., and J. P. and W. M. propose to take out 5,000 miner's inches, under a 4-inch pressure, from the San Joaquin River, or 100 feet of water; but to make sure that they can transport this quantity, they propose to make a canal 150 feet wide and 6 feet deep, which, even with a velocity of 1 foot a second, would transport 900 cubic feet of water per second—a large river in itself.

M. J. B. and R. B. propose to take 5,000 miner's inches of water from the San Joaquin River and transport it in a ditch 2 feet on the bottom, 4 feet on top, and 3 deep, with a grade of 16 feet to the mile. As the area of cross section of the ditch through which this 100 cubic feet of water per second must pass is only 9 square feet, the water must have a velocity of more than 11 feet a second, and therefore M. J. B. and R. B. should carefully line their ditch with cast iron, in order that it may not be washed away at the first rush.

These notices, taken at random from nearly 400 on record, illustrate the discrepancies which arise in the practice of hydraulics, as well as the uncertainties of appropriations under the existing prescriptions in the statutes.

#### SUMMARY.

The number of claims of water from the San Joaquin and its branches is 316, not including those from Fresno River and Chowchilla Creek.

"All water flowing in the San Joaquin River" is claimed in so many words by different persons six times, in addition to a total of 461,794 cubic feet, omitting all reappropriations. "All the flow" in many of the branches and forks of the San Joaquin was claimed over and over again; as, for example, Big Sandy, Whisky Creek, and Stevenson Creek.

The greatest flood flow, for even a short time, of the San Joaquin River, according to gagings during eight and one-half years by William Hammond Hall and J. B. Lippincott, is 59,800 cubic feet per second, and therefore the claims of water above given are nearly eight times the greatest flood flow of the river during this eight and one-half years specified, and are 172 times the average flow per second, 2,680 cubic feet, during the period mentioned. Of course, we must add to this total the sixfold claim of "all water of the river." As the water of the San Joaquin is not in the condition of an elastic vapor, one experiences great difficulty in understanding how all these claims could be satisfied.

On Fresno River and its tributaries 50 claims of water have been made. Besides 670,799 miner's inches, or 13,416 cubic feet per second, filed on, "all the water of Fresno River" was in addition claimed once. In five instances the quantity was not mentioned, and might have been anything from 1 miner's inch to the entire stream; and in another instance "enough water" was claimed, and only specified by the dimensions of the flume, namely, a flume 30 feet wide, 4 feet deep, and having a fall of 5 feet per mile, evidently carrying a generous quantity of water, which would have left comparatively little to other appropriators, even in flood season.

The waters of Coarse Gold Gulch, one of the tributaries of the Fresno River, were separately claimed three times over, in addition to 2,500 miner's inches, or 50 cubic feet per second. This being a small stream, dry at certain seasons of the year, the writer believes that some of the claimants must occasionally be disappointed.

Hall's record for the greatest mean rate of monthly discharge of Fresno River, during six years' observation, gives 1,632 cubic feet per second, and therefore the quantity of water claimed, in addition to "all the water of the river," is eight times this greatest mean flow per second, and is eighty times its mean yearly discharge, 160 cubic feet per second.

For the waters of Chowchilla Creek 14 claims have been made, aggregating 31,008 cubic feet per second, plus two claims for quantities not given. The gagings of Chowchilla by William Hammond Hall during the six consecutive years before specified gave the greatest flood water of this stream during that period as 10,770 cubic feet per second. Therefore, on this stream three times the amount of its greatest recorded flood flow per second has been claimed, or 204 times the annual uniform flow of the creek, which was 152 cubic feet per second.

Of the total number of claims to water from the San Joaquin and its branches,



omitting those from Fresno River and Chowchilla Creek, at least 115 of the total number (316) are so indefinitely described as to the point of appropriation or diversion that it would be exceedingly difficult, if not impossible, to determine that point. None refer to section, township, or range of the Government survey, and we find them usually oriented by means of natural objects, as trees, boulders, ranch houses, etc., which may have disappeared, been destroyed, or have changed owners.

Of the total number of claims to water from Fresno River and its branches, namely, 50, 21 are indefinite, as before described in the case of San Joaquin River, and for similar reasons.

Of the 15 claims to water from Chowchilla Creek, 3 are very defective, 2 being practically unrecognizable as to locality.

Besides those just mentioned, there were locations on 11 streams or lakes which I found impossible to identify. The claims amounted to 152,750 miner's inches, besides two quantities not given, and one claim to "all the water of Kelloggs Creek." After diligent and long-continued search in every quarter holding out any promise of information—and how careful that search was has already been indicated in describing our methods—the identification of these claims and streams was of necessity abandoned.

All the canal and irrigation companies taking water from San Joaquin River, Fresno River, or Chowchilla Creek, with probably the exception of the San Joaquin and Kings River Canal and Irrigation Company, claim vested riparian rights. Also, numerous individuals, riparian to one or more of these streams, make similar claims. None of these, so far as the writer could ascertain, has been adjudicated; and in consequence it is practically impossible to state their exact amount.

The following table sums up the claims on San Joaquin River and its tributaries so far as they are for definite amounts:

*Definite claims to water from San Joaquin River and tributaries.*

| Name of stream.                     | Number of claims. | Amount claimed. | Name of stream.                   | Number of claims. | Amount claimed. |
|-------------------------------------|-------------------|-----------------|-----------------------------------|-------------------|-----------------|
|                                     |                   | <i>Inches.</i>  |                                   |                   | <i>Inches.</i>  |
| Main San Joaquin River.....         | 70                | 28,244,420      | Kinsman Creek.....                | 1                 | 12              |
| North Fork.....                     | 67                | 4,432,706       | Minaret Creek.....                | 3                 | 3,300           |
| Little North Fork.....              | 6                 | 41,000          | Slick Rock Creek.....             | 1                 | 500             |
| First North Fork.....               | 4                 | 18,000          | Deer Creek.....                   | 1                 | 1,000           |
| South Fork.....                     | 4                 | 13,932          | Ross Creek.....                   | 1                 | 1,000           |
| Chowchilla Creek.....               | 12                | 2,550,400       | Mill Creek.....                   | 1                 | 4,000           |
| Chiquita River.....                 | 12                | 83,700          | First Clipper Mill Creek.....     | 2                 | 6,500           |
| Fine Gold Gulch.....                | 12                | 38,800          | Second Clipper Mill Creek.....    | 1                 | 5,000           |
| Fresno Slough.....                  | 1                 | 3,550           | Kings Creek.....                  | 1                 | 1,000           |
| Whisky Creek.....                   | 20                | 10,900          | Jackass Creek.....                | 1                 | 100             |
| Sand Creek (probably more than one) | 9                 | 15,000          | Bear Creek.....                   | 1                 | 800             |
| Big Creek.....                      | 9                 | 252,775         | North Branch Creek.....           | 1                 | 300             |
| Segituna Creek.....                 | 2                 | 360             | Rock Creek.....                   | 1                 | 400             |
| Kaiser Creek.....                   | 16                | 17,700          | Quaking Aspen Creek.....          | 1                 | 200             |
| Little Dry Creek.....               | 1                 | 1,500           | Sockanew Creek.....               | 1                 | 100             |
| Stevenson Creek.....                | 7                 | 159,440         | Fresno River and tributaries..... | 41                | 649,576         |
| Pitman Creek.....                   | 3                 | 12,500          |                                   |                   |                 |
| Winchell Gulch.....                 | 1                 | 1,000           | Total.....                        | 315               | 36,571,471      |

NOTE.—It was found impossible to make exact groupings of streams, but those given are approximately correct.

### EVOLUTION OF WATER LAWS IN CALIFORNIA.

As stated before, the history of irrigation in California began, from a legal standpoint, with the coming of the gold seekers in 1848. Previous to that time the mission fathers had cultivated their vineyards and orchards, using aqueducts and small systems of artificial irrigation modeled on the method of Mexico and Spain; but very little water had actually been used and no occasion for dispute or necessity for local laws had arisen.

But with the coming of the miners and the location of their mining claims water for their working became an imperative necessity, and often the water acquired had to be conveyed by means of ditches and flumes. The necessity for laws to regulate these appropriations of water was evident. Each locality adopted its own simple rules, based on common sense and justice, and, as before stated, those of the different mining districts, however widely separated, were practically identical. The lands being a part of the public domain of the United States, the first appropriator was held to have, within certain well-defined limits, a better right than others to the claim he had taken up, and this rule was also applied to the water necessary to the working of the claim. The first appropriator of water to be conveyed to a locality for mining or other beneficial purposes was recognized as having, to the extent of actual use, the better right. The doctrine of the common law respecting the rights of riparian owners was not considered applicable, or, at most, only in a very slight degree, to the conditions of miners.

In 1851 the State legislature of California enacted a law sanctioning the "mining customs" when not in conflict with the constitution and laws of the State. This enactment was based upon a new principle governing the rights to water in the United States, the principle of priority of appropriation or of the first appropriator being first in right.

But in 1850 the legislature had adopted the common law of England when not in conflict with the Constitution of the United States or the constitution of California. Thus there were established in the State two distinct systems or rules of law governing the use of water, one having its foundation in the equal right of all riparian owners to the flow of the stream, without material diminution in quantity or alteration in quality, regardless of any priority, and the other having for its basis the law of priority of appropriation and use, without any ownership of the soil being necessary, and without any obligation on the part of the owners to turn the water thus diverted back into the natural course of the stream.

The law of riparian rights, brought over from England, a nonirrigating country, and embodied in our common law, has been greatly modified in its application. The right of the riparian owner to have the waters of the stream flow past his lands "unpolluted and undiminished in volume" has been encroached upon by the necessity of other riparian owners to use water for irrigation; and the question, Shall irrigation be considered an artificial or a natural use of water? has been answered by the courts. The courts hold that the circumstances of the case should decide the question. In a country where irrigation is a necessity, as in California, irrigation is a natural and reasonable use of water; and riparian owners are entitled to use the waters flowing



past their lands for that purpose within reasonable limits. Rights acquired under the civil, Spanish, and Mexican laws before California was transferred to the United States were also by treaty and statute fully protected.

#### STATUTORY LAWS RELATING TO WATER RIGHTS.

On the 1st of January, 1873, the civil code of California went into effect. Among its provisions are the following for the acquisition of water rights:

SEC. 1410. The right to the use of running water flowing in a river or stream or down a canyon or ravine may be acquired by appropriation.

SEC. 1411. The appropriation must be for some useful or beneficial purpose, and when the appropriator or his successor in interest ceases to use it for such a purpose the right ceases.

\* \* \* \* \*

SEC. 1414. As between appropriators the one first in time is the first in right.

SEC. 1415. A person desiring to appropriate water must post a notice in writing in a conspicuous place at the point of intended diversion, stating therein:

(1) That he claims the water there flowing to the extent of (giving the number) inches, measured under a four-inch pressure.

(2) The purpose for which he claims it, and the place of intended use.

(3) The means by which he intends to divert it, and the size of the flume, ditch, pipe, or aqueduct in which he intends to divert it.

A copy of the notice must, within ten days after it is posted, be recorded in the office of the recorder of the county in which it is posted.

It will be observed that the particular form of notice is not prescribed. The courts have decided that the notice need merely be sufficient to give any intelligent man proper warning, and its language must be liberally construed.

Due diligence in diverting the water and completing the works after the posting of the notice is required by law, and neglect to comply with this regulation brings forfeiture as against a subsequent claimant who has complied with the law.

#### RIGHTS OF RIPARIAN PROPRIETORS.

In the civil code it was provided, by section 1422, that "The rights of riparian proprietors are not affected by the provisions of this title." This section was repealed by the legislature in 1887, with a proviso. Sections 1 and 2 of the repealing act read, in part, as follows:

SEC. 1. Section 1422 (describing) is hereby repealed; provided that the repeal of this section shall not in any way interfere with any rights already vested.

SEC. 2. This act shall take effect from and after its passage.

Although this repealing statute seemed to be, at the time of its passage, positive and definite in its intention to absolutely abolish the riparian law, yet it has been held by the courts to in no wise affect the riparian rights of private lands, and to apply only to the public lands and their waters belonging to the United States.

With the exception of the act repealing the law of riparian rights, the statutory enactments previously given simply embody the principles and practice in the matter of water rights previously recognized in the State.

**THE WRIGHT DISTRICT LAW.**

In 1887 the now famous "Wright law," so called, was enacted. It was entitled "An act to provide for the organization and government of irrigation districts and to provide for the acquisition of water and other property, and for the distribution of water thereby for irrigation purposes."

Its passage grew out of a desire to end the interminable litigation arising between the appropriators of water for beneficial purposes, on the one hand, and the riparian owners, holding rights acquired before the repeal of the riparian law, as before explained, on the other. This litigation had threatened the life of irrigation in California, and it was generally felt that a decisive step must be taken in the right direction.

This law provides for and authorizes the formation of public corporations called "irrigation districts."

Section 1 provides that 50, or a majority of the holders of title to lands susceptible of irrigation from a common source and by the same system of works, may organize an irrigation district under the provisions of this act.

Section 2 provides the manner in which the district shall be organized, namely, by petition to the board of supervisors and the filing of a sufficient bond in double the amount of the probable cost of organizing the district. The board of supervisors may exclude from the proposed district any lands which will not be benefited by its formation. The matter shall then be voted on by the people at an election held for that purpose and conducted as nearly as practicable in accordance with the general laws of the State. A two-thirds vote in favor of the formation of the district is necessary to authorize it.

Sections 3 to 11, inclusive, relate to the election of officers and their duties.

Section 12 confers authority upon the board of directors of the district to acquire—by purchase or condemnation, or other legal means, all rights and water rights and other property necessary. \* \* \* In case of purchase, the bonds of the district hereinafter provided for may be used at their par value in payment, and in case of condemnation the board shall proceed in the name of the district according to the laws of the State provided in such cases. The use of water required in any irrigation district, together with the right of way for canals and ditches, sites for reservoirs, and all other property is hereby declared to be a public use.

Section 13 provides that the legal title to all property acquired under this act shall immediately vest in such irrigation district, and shall be held by such district in trust.

Section 15 provides for the issuance of bonds to raise money for construction, provides for special elections on the question, for the method of payment of the bonds, and for special assessments when the sale of the bonds fails to furnish sufficient money to complete the work.

Section 17 provides that the bonds and their interest shall be paid by means of an annual assessment upon the real property of the district, such assessment to be a preferred lien.

Section 34 provides for the payment and redemption of the bonds.

Sections 35 and 36 provide for bids for the construction of the irrigation works and for the payment of said work.



Section 43 provides for the apportionment of water pro rata in case of deficiency.

Section 45 specially provides that the navigation shall not be impaired by the operation of this act, nor shall any vested rights already existing in water used for mining purposes be disturbed.

Section 46 provides that none of the provisions of this act shall repeal or in any wise modify the provisions of any other act relating to the subject of irrigation or water commissioners; nor shall any private property be taken or injured without compensation.

A number of supplementary acts have been passed since the enactment of the law, modifying or strengthening certain portions of the act.

This law has been repeatedly attacked in the courts of the State, and at every assailable point, but has, without exception, been held to be constitutional by the supreme court of the State. It has also been carried into the United States courts, and although declared unconstitutional in a decision by United States Circuit Judge E. M. Ross, was subsequently upheld by the Supreme Court of the United States on the points involved.

A large number of irrigation districts have been organized in the State, and many of them, particularly in southern California and in Kern and Tulare counties, have been successful; but others have been at least financial failures. It would seem to the writer that the lack of success in these instances was not due to defects in the law, nor to the difficult engineering problems involved, but to bad financial and executive management. In some instances where districts have been organized and bonds issued, interest is long overdue and irrigation works have not been as yet constructed, or at least completed. The farmers in the district are assessed when no benefits are immediately derived. Default in payment of interest and expenses has resulted, and the financial state of the irrigation districts is in a chaotic condition. Such outcome, as the writer believes, is much to be regretted, as, with skillful management, under naturally favorable circumstances, the irrigation-district system ought always to be successful. It involves the idea of local self-government, control, and taxation, and disposition of the taxes received, and, further, retains for the use and benefit of the farmers in the immediate locality the waters which otherwise might be diverted to remote districts.

#### **LITIGATION OVER WATER RIGHTS ON SAN JOAQUIN AND FRESNO RIVERS AND CHOWCHILLA CREEK.**

##### **IN THE SUPERIOR COURT OF FRESNO COUNTY.**

As compared with other rivers in the State, there has been very little litigation growing out of disputes over water rights in these rivers; and the cases that have occurred are scattered over a number of years. In many of the cases the disputes arose over a construction of the rights of riparian owners, as opposed to those of appropriators. No adjudication of the water rights of any of the canal or irrigation companies taking water from any one of these streams has been had.

The first case of any interest is that of Wm. Howard et al. *v.* John G. Stitt, No. 522, Fresno County. The complaint recites that Fresno River flows over and through a certain section, township, and range; and that for many years previously the

grantor of plaintiffs appropriated for irrigation purposes the waters of said river to the amount of 17,800 inches, and that said water has since been used to irrigate the lands of plaintiffs and others. This claim is based on prior appropriation, and also on riparian rights. The specific complaint against defendant is that he is building a canal to take water from the river above the point of diversion of plaintiffs, and will thereby reduce or entirely cut off their supply, and an injunction is prayed for. Although this action was begun some seventeen years ago, subsequent proceedings have not been taken, and the action still remains in the lower court.

In 1889 an action was brought to establish the validity of the organization of the Madera irrigation district and of its bonds. The right to appropriate water from the river is not questioned—only the legality of the district organization. The principal opponents of the district were riparian owners, such as Miller & Lux, George D. Bliss, the California Pastoral and Agricultural Company, the Sierra Vista Vineyard Company, and others. The action was decided by the local court in favor of the district. An appeal was taken to the supreme court of the State. The district, however, while the matter was pending in the supreme court, confessed error, and the order of the trial court was thereupon reversed.

The case of Chapin *v.* Albert Brown et al., No. 4272, brings in the matter of conflict between riparian rights and rights by appropriation. Plaintiff averred that Whisky Creek flowed over and through his lands, and that he used the waters of said creek for irrigation and domestic purposes. This complaint clearly set up riparian rights. The plaintiff complained that defendants intended to divert the waters of said creek by means of a dam to be built above plaintiff's land, by reason of which plaintiff's water would be cut off or reduced greatly in amount, and he prayed for an injunction. Defendants answered that they also owned certain lands bordering on said stream, and moreover, that they had appropriated certain waters of said creek pursuant to law, and had prosecuted diligently the construction of irrigation works, thus making their claim both on riparian rights and appropriation and use. In this case the law of riparian rights was upheld by the trial court. The defendants having been unable to show that the water they proposed to divert was to be used on riparian lands, judgment was entered in favor of the plaintiff. An appeal was taken to the supreme court, which reversed the judgment and remanded the cause for a new trial. The remittitur was filed in 1894. No further action has been taken since then. This case is a good illustration of the conflict arising between existing riparian rights and rights by appropriation and use.

The case of Jesse B. Ross *v.* James Lawson (No. 4821), brought in 1894, involved the question of priority of right by appropriation. Plaintiff claimed all the waters of Sockanew Creek by appropriation and use; defendant claimed 60 inches of said water by appropriation and use for five years before the commencement of the suit. Judgment was rendered for the defendant.

In 1894 Miller & Lux, a corporation, brought a suit against the Fresno Flume and Irrigation Company (No. 8382), praying for an injunction to prevent defendants from diverting the waters of Mill Creek and its tributaries. Plaintiff averred that it owned land in the counties of Fresno and Madera, aggregating some 186,700 acres, situated along and bordering on San Joaquin River, and certain sloughs adjacent thereto, and claimed the waters of said streams necessary for the irrigation and cul-



tivation of said lands by virtue of riparian ownership and usage for twenty years. They stated that defendants proposed to dam Stevenson Creek and Mill Creek, and to divert the waters of said streams from their natural channels, thus preventing them from flowing into San Joaquin River, as they naturally would do, at a point above the land of plaintiff. This suit involved questions of the right of appropriators to take from a stream flowing past riparian lands, by interfering with any tributary flowing into the stream above the land of the riparian owner. Other minor questions were also involved. The case has not come to trial, the defendants having as yet not filed an answer.

In March, 1899, Miller & Lux, a corporation, and the San Joaquin and Kings River Canal and Irrigation Company, filed a complaint against the Enterprise Canal and Land Company et al. (No. 8636), claiming that Miller & Lux were the owners of certain tracts of land bordering on San Joaquin River and its branches, and that they had owned said lands for twenty years past, and that said lands were irrigated and cultivated by means of the waters of said stream. They set up, then, claim as riparian owners. To make this claim more decided they went further, and stated that a great part of these lands (being in fact the wild grass lands) had been overflowed yearly by the flood waters of said stream, thus being rendered exceedingly fertile without need of artificial irrigation. That under their claim and right as riparian owners and appropriators, plaintiffs had constructed and used numerous canals and branches leading out of said river. The San Joaquin and Kings River Canal and Irrigation Company also claimed right to waters taken out of said river in its canal system, by appropriation and usage for twenty-five years past. Plaintiffs claimed that their canals could be easily supplied only by water from San Joaquin River, and that the lands irrigated thereby could be irrigated only from that stream, and claimed the right, by appropriation and usage, to take from said stream 3,350 cubic feet per second of the water there flowing, and claimed that defendants had no right to take any water from the river until plaintiffs' claim had been satisfied. Then returning to its claim as a riparian owner, to have certain lands overflowed by the flood waters of the stream plaintiffs denied the right of defendants to diminish the flow of the river by the diversion of water, thus preventing this flooding which was beneficial to plaintiffs' lands, and which occurred yearly if the stream was allowed to take its natural flow of water past and over plaintiffs' lands. Having thus set up their rights, plaintiffs stated that some time during the year 1898 the defendant Enterprise Canal and Land Company, constructed a large canal or ditch above the lands of plaintiffs for the purpose of taking water from San Joaquin River, and known as the Enterprise Canal and Land Company's Canal, and that in March, 1899, the defendant actually diverted through said ditch a part of the flow of San Joaquin River, which water rightfully belonged to plaintiffs; and, further, that the water thus taken was to be used in the irrigation of lands not riparian to San Joaquin River. Plaintiffs prayed for an injunction staying defendant from taking said water.

In answer to this lengthy complaint the defendant Enterprise Canal and Land Company, except through a general denial of all the allegations of the complaint, did not deny the riparian rights of the plaintiffs to a reasonable use of the waters of San Joaquin River, but principally based its claim upon the right of outside parties to appropriate water of a stream not covered by claims of other companies or indi-

viduals. And here it raised a question of fact, denying that the plaintiffs, Miller & Lux, and the San Joaquin and Kings River Canal and Irrigation Company, had at any times diverted or used 3,000 cubic feet of water per second from said river, or any amount in excess of 480 cubic feet of water per second, and denied the right of plaintiffs to divert more than 480 cubic feet of water per second; and further alleged that there was at all times flowing in San Joaquin River water greatly in excess of this amount, and sufficient to enable both plaintiffs and defendant to take out all the water rightfully belonging to them. It admitted that it did construct said ditch or canal, and did divert water through it, but declared that it had a right to do so, there being in the river water in excess of the amount rightfully belonging to plaintiffs. Of course the question of the amount of water rightfully to be claimed by either party was largely to be answered by evidence. The plaintiffs, as prior appropriators, were of course entitled to the full amount of water they had claimed and actually used; but if there had been water in excess of this amount it would seem that a later appropriator would have the right to take that excess. But there, again, the riparian rights of the plaintiffs came in and complicated the matter. Would the taking out, through a canal above the lands of the plaintiffs, of these waters, have so diminished the stream as to interfere with plaintiffs' riparian rights? This would also seem to be a question to be answered by the evidence. But the matter of the construction of the law came in on their claim to have their lands flooded yearly by the surplus water of the river, without interference by other parties; and it was this claim that the defendant most strongly contested.

It further asserted that plaintiffs, as canal owners and irrigation companies, had no right to engage in farming and cultivation of the soil, using thereon the waters taken from the San Joaquin through their canals. It further averred that the dam of the San Joaquin and Kings River Canal and Irrigation Company between the mouth of San Joaquin River and Sycamore Point was a nuisance, and obstructed navigation. Defendant claimed the right to divert 500,000 cubic inches of water, measured under a 4-inch pressure, and also to receive into its canal or ditch all the overflow water of the San Joaquin claimed by the plaintiffs as riparian to their lands. As will be seen, this was a very important suit, embracing a large number of perplexing questions; yet, withdrawing the case from its side issues, it resolved itself into a conflict between certain riparian proprietors protesting against any diminution of the stream on which their lands were situated, and claiming also as appropriators and actual users of the water, and another appropriator who claimed the right to construct a canal and take water from the stream at a point above the lands of the riparian owners, said water to be used for the irrigation and reclamation of lands which probably could not be otherwise irrigated, but which were not riparian lands. The riparian owners and first appropriators claimed that their necessities and rights cover the normal flow of the stream. The second appropriators claimed that they did not. The riparian owners and appropriators claimed that the overflowing of their lands by the flood waters of the stream was a part of their riparian rights. The second appropriator claimed his right to divert all this flood water into his ditch, to be carried on to certain other lands, there to be used for irrigation. Another defendant sued herein, Jefferson James, set up a similar defense, but in addition claimed riparian rights on Fresno Slough, a natural water course flowing into the San Joaquin. A complaint



in intervention was also filed by one Mowrey, claiming riparian rights on the San Joaquin, through Fresno Slough and other branches, declaring that if the overflow waters of the San Joaquin were diverted into the ditch of the Enterprise Canal and Land Company his lands would suffer thereby, through not being annually overflowed; and further, that any diversion of water from the San Joaquin by defendant would so reduce the flow of the river as to deprive intervenor of water to which he was entitled for the irrigation of his land. This very important suit came up for trial and was submitted on briefs April 10, 1900. The court rendered its decision August 1, 1900, the substance of which is as follows:

In an action where the plaintiff claims that his rights have been or are likely to be invaded by some unlawful act on the part of defendants it is first necessary for the plaintiff to show that he has the right which he claims to have, and that by the unlawful act of the defendant he has been or is likely to be deprived of those rights. The evidence shows that the plaintiff, the San Joaquin and Kings River Canal and Irrigation Company, has been diverting water from San Joaquin River by means of a dam thrown across the river. The question, then, presented is, Can anybody ever acquire any right to divert water by means of a dam or otherwise out of a navigable stream? It is recognized as a fundamental principle that no one has the right to do anything which will in any way destroy the navigability of any stream. It is my opinion that said company has not acquired any right, by prescription or otherwise, to divert any water from San Joaquin River, and that, having no right, it can not ask the court to prevent some one else from interfering with that which it never possessed, to wit, the right to divert water from San Joaquin River. It is contended by the plaintiff that this question can not be raised in an issue between private parties. It is not an issue raised between the parties in this action, but it is the failure of proof on the part of the plaintiff, said company, to show that its rights have been or are likely to be invaded by defendant in this action, as it has failed to show that it ever had the right to appropriate water from San Joaquin River. The act of the plaintiff, said company, being unlawful from its inception, it can not found a right on an unlawful act, and I am of the opinion that the plaintiff, the San Joaquin and Kings River Canal and Irrigation Company, is not entitled to recover in this action for any acts complained of on the part of defendants. The plaintiff, Miller & Lux, a corporation, also complains of the defendant in this action for diverting and threatening to divert the water from San Joaquin River at a point above its lands, which it claims are riparian to said river. The evidence and the stipulation of the parties show that Miller & Lux have large bodies of land which are riparian to said river; and the evidence shows that the defendants have diverted and intend to divert the waters of said river at a point above said land. The defendants claim that the lands of James, one of the defendants, are riparian to the said river, and are above the lands of Miller & Lux, and that the defendants, therefore, have the right to divert sufficient water to irrigate their riparian lands. The evidence shows that the lands claimed to be riparian lie on what is known as Fresno Slough, which is claimed by defendants to be a part of the San Joaquin River; but the evidence shows that it is no part of said river; that it is a channel made from the overflow from Kings River during the flood times, and that none of the lands of defendant James are riparian to the San Joaquin River. It follows, then, that the contention of the defendant must fail on that point. The evidence in this case is insufficient to enable me to say at what stage of the water the defendants may divert water from the river without injury to Miller & Lux. When there is an invasion of any right the presumption of law is that an injury has been done, and it devolves upon the defendant to show that by the acts complained of plaintiff has not suffered and will not suffer any injury. In this case there is no question but that the diversion of water from San Joaquin River by defendants has done injury, and it follows that the defendants in this action must show that no injury can accrue to the plaintiffs, Miller & Lux, or to the intervenor, J. J. Mowrey. The defendants having failed to establish that fact, I am of the opinion that Miller & Lux are entitled to a judgment of a perpetual injunction against the defendants in this case; and this applies also to the intervenor, Mowrey, and to the San Joaquin and Kings River Canal and Irrigation Company, in so far as its rights as a riparian owner are concerned in this action. It is therefore ordered that judgment in this case be entered—

(1) That the plaintiff, the San Joaquin and Kings River Canal and Irrigation Company, take

nothing by its action in so far as its claim of right by reason of diversion of water from San Joaquin River is concerned; and

(2) That judgment in favor of Miller & Lux, and intervenor Mowrey, be entered against defendants, enjoining them from diverting any water out of the San Joaquin River; and

(3) That judgment be entered in favor of the San Joaquin and Kings River Canal and Irrigation Company, in so far as its right as a riparian owner in this action is concerned, enjoining each and all of the defendants from diverting any water out of San Joaquin River.

(4) That each party pay its own costs incurred herein.

An act of Congress of the year 1890 makes it unlawful to build any dam or weir, or any other structure which shall interfere with navigation, across or in a navigable river unless the permission of the Secretary of War be first obtained. The plaintiff in this case, the San Joaquin and Kings River Canal and Irrigation Company, did construct a weir across San Joaquin River just below Fresno Slough in the year 1898, and although this weir has a falling section at one end designed to permit the passage of vessels up and down stream, still the company failed to establish to the satisfaction of the court that this new dam, or possibly the old one which was in use previously and which also had a falling section, was not an interference with navigation and a public nuisance. The point made by Judge Webb in this connection is that a right and a claim can not be founded on a wrong, and therefore the company claiming the right to divert water by means of this illegally constructed dam had no right to complain of injury by reason of diversion of defendants. It would seem that the court decided that no one has the right to divert water from any navigable stream by means of a dam or weir which would interfere with navigation. This point in the decision covers broad ground. The riparian rights of the company, and also of Miller & Lux, were apparently sustained and protected. The course is still left open to the enjoined defendants to bring suit against the company and Miller & Lux to determine the extent of their riparian rights, and thereby to ascertain if sufficient water is not left in the river for the filling of the James Canal.

In March, 1900, Miller & Lux and the San Joaquin and Kings River Canal and Irrigation Company filed a complaint against Agnes Borland, setting forth grounds of complaint similar to those in the last suit mentioned (No. 8636), except that the dam and a pumping plant are alleged to have been erected on Fresno Slough, a tributary of the San Joaquin. The questions involved are very similar to those in the case last mentioned. The number of the case is 9004, Fresno County. At the time of submitting this report the defendant had not answered in this complaint.

Case No. 7969, September, 1897, William Lowry brought suit against the San Joaquin and Kings River Canal and Irrigation Company for damages to a crop of grain belonging to plaintiff, caused, as alleged, by submerging it by the waters backed up by defendants' dam across the San Joaquin. The pleadings do not disclose any questions of water rights or irrigation, but in the trial the proofs were largely in that direction. Judgment was rendered for plaintiff for \$20,000 damages. An appeal was taken and the case is now in the supreme court.

#### IN THE SUPERIOR COURT OF MADERA COUNTY.

Madera County was formed from a portion of Fresno County in 1892, and consequently the amount of litigation growing out of water claims on the San Joaquin and its tributaries, as conducted in this county, is comparatively small.



An important case, which at the time my search was made had not yet been tried, is that of the Madera Canal and Irrigation Company *v.* Miller & Lux, the San Joaquin and Kings River Canal and Irrigation Company, and certain individuals. Plaintiff claimed right to use of all waters flowing in Fresno River, and in certain branches and tributaries the waters of which have been diverted into the channel of Fresno River, by right of prior appropriation and use, said appropriation and use dating back over a period of twenty years. Plaintiff also claims riparian rights on Fresno River. Plaintiff states that for some ten years last past it has concentrated said waters thus claimed at a point in the bed of Fresno River above a certain dry channel or waterway known as Cottonwood Creek, and that said waters have been permitted to flow past said dry channel and on down to the lands irrigated by plaintiff, the bed of Cottonwood Creek being higher than that of Fresno River. The complaint then charges defendants with lowering the bed of Cottonwood Creek and with removing plaintiff's dam therefrom, in order to divert into the creek a certain portion of the waters of Fresno River flowing past that point. The complaint prays for an injunction preventing this diversion on the part of the defendants and also asks to be adjudged the owner of, and entitled to the use of, all the waters flowing in the bed of Fresno River. An amendment to the complaint has been filed, setting up the further ground that Cottonwood Creek is a false and unnatural water course and slough. The defendants answer that Cottonwood Creek is a natural water course, and further, that Miller & Lux have riparian rights thereon. They allege that at certain times of the year (probably during floods) a certain amount of water flows from Fresno River into and down said Cottonwood Creek; and they admit that during the year 1899, desiring to divert a certain portion of the waters of said creek and of said river for the purpose of irrigation, they did enter upon said creek, and did propose to divert said water, and posted a notice to that effect at the intersection of Fresno River and Cottonwood Creek, claiming 25,000 miner's inches; and admit that they did commence to enlarge and improve the channel of Cottonwood Creek. They deny that they intended to divert any water from Fresno River which plaintiff has any right to use, and promise that, if permitted to go on with their work, they will not divert any water to which plaintiff is entitled, but merely ask permission to appropriate water in excess of the amount rightfully belonging to plaintiff. Miller & Lux filed a cross complaint against plaintiff, claiming right of way over and along Cottonwood Creek, and the right to construct a canal along said right of way, and charge that subsequent to its acquirement the plaintiff, Madera Canal and Irrigation Company, entered upon Cottonwood Creek and constructed a dam therein, thus preventing defendants, Miller & Lux, from obtaining any water from Fresno River, and pray that plaintiff be enjoined from entering on said right of way or constructing any such dam. The Madera Canal and Irrigation Company answered the cross complaint, reiterating its denial that Cottonwood Creek is a natural water course, and declaring that the dam built by it across its mouth was made only in order to restore a portion of its works which had been destroyed by defendants. A number of amendments to the complaints and answers have since been filed by each side. The California Pastoral and Agricultural Company intervened in this suit, and claims that it has riparian rights along the lower portion of the Fresno River, and that it claims the natural flow of the river in that locality for

irrigation of its lands and the watering of its stock. It also claims that this diversion of the water by Miller & Lux would infringe upon its right and prevent this irrigation and watering of the stock. It therefore prays for an injunction, preventing Miller & Lux from making such diversion. The case has not as yet come to trial. Here, as may be seen, all parties claim riparian rights, and rights also by appropriation. The question at issue would seem to be whether Miller & Lux, by enlarging and lowering the channel of Cottonwood Creek, so as to divert a greater amount of water into it from Fresno River, would so reduce the flow of the latter stream as to encroach upon the rights of plaintiff and intervenor, as riparian owners, and upon the former as prior appropriators. The question as to whether or not Cottonwood Creek is a natural water course is also an important one.

The case of *Goode v. The San Joaquin Electric Company*, where damages are claimed by plaintiff by reason of diversion of water above his riparian lands, has been tried, decided in favor of plaintiff, with small damages, and has been settled between the parties without appeal to the supreme court. In this case Goode claimed that the defendant company, by constructing a dam to impound water with which to generate electricity, had shut off his supply from the stream on which he owned riparian lands, and where he had been in the habit of watering his stock. The facts seemed to be established to the satisfaction of the court, and small damages were awarded.

The case of the *California Pastoral and Agricultural Company v. George D. Bliss et al.* (No. 559) came up in 1898. Plaintiff claimed all the water flowing in Chowchilla Creek, both as riparian owner and by right of actual use for ten years past; that defendants claimed some right in said creek, and have within the last five years built a dam across the channel thereof, which practically diverts all the water of said stream, except in times of flood; and that he, by means of canals, carries said water to another locality, and with it irrigates land distant from the channel of said stream. Plaintiff prays for \$10,000 damages, and also to be adjudged the owner of, and entitled to the use of, Chowchilla Creek. Defendant George D. Bliss answers that Chowchilla Creek is a natural channel down to the point where it empties into Ash Slough, and that even in times of freshet a large portion of the water of Chowchilla Creek flows into and down Ash Slough, and that the only water which flows down the bed of Chowchilla Creek below that point is either superfluous flood water or water which is discharged in Chowchilla Creek by artificial means, that is, the water which is turned back into the Chowchilla from Ash Slough by the Sierra Vista Vineyard Company for the purpose of irrigating lands owned by it bordering on the Chowchilla. Defendant then sets up a claim to water from the Chowchilla as a riparian owner, and claims that he has maintained a dam, known as Montgomery Dam, across the Chowchilla, from 1878 to 1891, for the purpose of diverting water for the irrigation of his lands, and has turned back into the Chowchilla all water not absorbed in his process of irrigation. He states, further, that ever since 1878 defendant and his grantors have claimed and used said water, adversely to plaintiff, and with plaintiff's knowledge; and that since the erection of a dam by defendant, in 1893, said defendant has continued to divert said water and use it for purposes of irrigation, as he has a right to do; and, further, that if all the water of the stream were permitted to run past this dam in section 29 and down to Montgomery Dam, so called, in section 34,



the loss by evaporation, etc., would be so great that, after the proper use of the water by defendant for irrigation, no water would be left to pass on down the channel of the Chowchilla. He adds that during times of freshets there is abundance of water flowing in the Chowchilla throughout its entire course, and prays that the court adjudge defendant entitled to the use of all said water except in times of freshets, and that plaintiff be adjudged entitled to no water from said stream except in time of freshets. This is a case of dispute between two riparian owners on the same stream, and is a question as to how much of the waters of the stream the first owner is entitled to divert and use. Another question also arises, whether his construction of a second dam, farther up the stream, tends to materially diminish the flow of water below his lands. This case illustrates very strongly the benefit that would accrue along the Chowchilla by the storing and proper distribution of its flood waters.

#### IN THE SUPERIOR COURT OF MERCED COUNTY.

The suit of *J. J. Stevenson v. San Joaquin and Kings River Canal and Irrigation Company* (No. 1767) is apparently the complaint of a riparian owner and canal corporation, entitled to take water from San Joaquin River for irrigation purposes, against another appropriator whose lands, plaintiff claims, are not riparian to the river. The defendant has erected a dam across the San Joaquin above the land of plaintiff, has diverted water thereby, and has not returned it to said river, whereby plaintiff claims to be damaged to the extent of \$10,000, and prays for an injunction preventing defendant from interfering with the flow of said stream. Defendant denies the claim of plaintiff to the use of the water, dating back to 1871, and claims prior right to the use of said water, and also declares that plaintiff is estopped from bringing action by section 318, code of civil procedure, and by section 319, Subdivision II, and section 338. This case has not yet come to trial.

#### IN THE SUPERIOR COURT OF MARIPOSA COUNTY.

In the year 1900 a suit was brought in the superior court of Mariposa County by John R. Hite against the Madera Canal and Irrigation Company. He charges the company with diverting the waters of Big Creek and Raynor Creek so that they no longer empty into the Merced River, on certain forks of which Hite's lands are riparian. He states that prior to the alleged diversion by defendant plaintiff used the waters of the South Fork of Merced River for power and irrigation; that one of the tributaries of said South Fork of Merced River is a stream known as Big Creek, and that one of the tributaries of the said Big Creek is a stream called Raynor Creek. That defendant has a dam on Big Creek, by means of which certain of its waters are diverted. Plaintiff avers that Raynor Creek, when flowing in its natural course, empties into Big Creek at a point below this diverting dam; but that defendant has constructed a ditch from Raynor Creek to a point in Big Creek above its diverting dam, thereby taking its waters and preventing their flowing in their natural course down to the lands of plaintiff; and, further, that defendant has constructed a ditch connecting Big Creek with Fresno River, and now divert the waters of Big Creek into said river instead of allowing them to return to Merced River, of which Big Creek is a natural tributary, and on the South Fork of which plaintiff's lands are situated. He prays for damages, and that defendant be made

to desist from such diversion of water. The answer to this complaint states, in effect, that plaintiff abandoned the use of said water about twenty years ago, and has, therefore, lost his claim thereto, and, further, that the defendant has been using continuously said water during the past fifteen years. This is a conflict between a riparian claimant and an appropriator and diverter of water from its natural course, at a point above the land of the riparian owner, by an irrigation company. As both parties also claim certain rights by appropriation and usage, the proof will necessarily have to go toward the establishment of priority of claim and actual use of water, as well as toward the adjudication of the riparian right of the owner. The question arises, also, Can a riparian owner forfeit his right by disuse?

It will be noticed that the majority of these cases are still in court, and the questions raised still undecided. While probably other cases involving similar questions have been tried and decided in other sections of the State, still in the actual trial of each individual suit many new points arise causing it to differ materially from any other on record. It would be extremely difficult, as well as unwise, to attempt to quote decisions already given in cases parallel as to pleadings, but perhaps differing in essential facts from these still unadjudicated cases.

#### INVESTIGATIONS IN THE FIELD.

My field work consisted in inspecting the canal systems of the companies now taking their water from San Joaquin River, Fresno River, and Chowchilla Creek; in surveying and mapping the streams at and near the sites of the headgates of the several canals; in measuring and photographing the structures, and in gaging the flow of the principal canals (Pls. XXI, XXII, XXIII).

#### CANALS ON SAN JOAQUIN RIVER.

All the ditches or canals taking water from San Joaquin River are made entirely in cut or excavation, no tunnels or flumes being required in the flat river bottom. The headgates, ditches, stopgates, and weirs generally are of timber, and are constructed in the usual form.

#### UPPER SAN JOAQUIN RIVER CANAL COMPANY.

The system of this company was designed to irrigate the lands of the higher plains at and near Herndon, belonging to the Bank of California and others, as well as to water the bottom lands of the river between its high banks from Hamptonville as far as points some miles below Herndon. Its headgate was on the left or southeasterly bank of the stream, just above a weir, about 900 feet long, which run entirely across the river at a point one-half mile below Hamptonville (now Pollasky). The canal and irrigation scheme was a complete failure, the weir being repeatedly broken down in spite of extensive and costly repairs, and the canal cut out and washed away by lateral water courses or through gopher or squirrel holes in the side hill levees. In 1887 the work was abandoned. The area to have been served has since been supplied with water brought through ditches from the Kings River.





FALLING GATE OF NEW DAM NEAR MENDOTA FROM BELOW



DROP GATE ON DITCH NEAR LOS BANOS



REGULATOR GATE ON CHINA CAMP SLOUGH



RUINS OF WEIR ACROSS SAN JOAQUIN RIVER BELOW POLLASKY

## IRRIGATION SCENES

### ALONG THE SAN JOAQUIN RIVER



JUNCTION OF SAN JOAQUIN RIVER AND FRESNO SLOUGH



REGULATOR GATE ON JAMES CANAL



DROP GATE ON LATERAL FROM PARALLEL CANAL

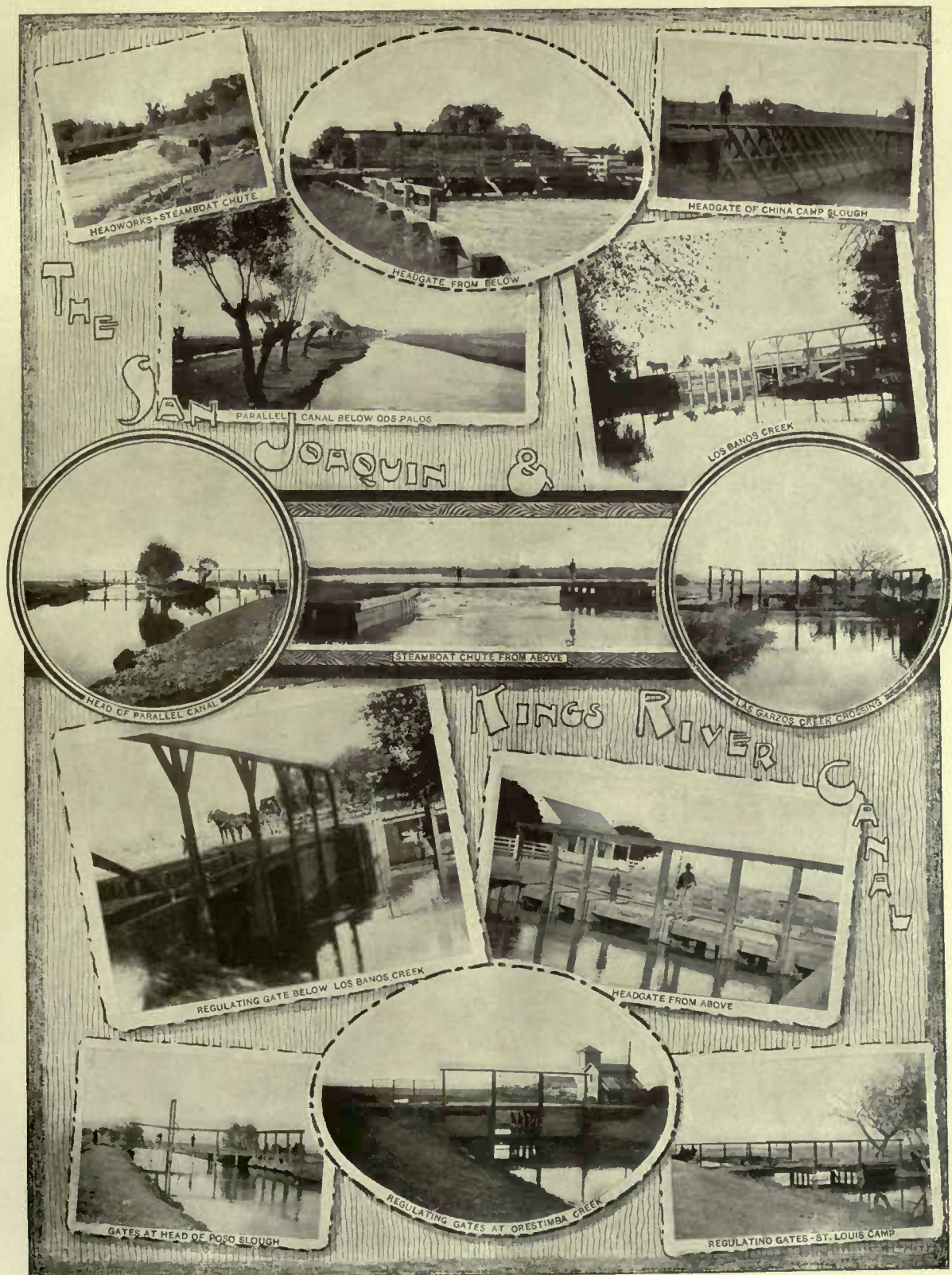


FALLING GATE OF NEW DAM NEAR MENDOTA FROM ABOVE







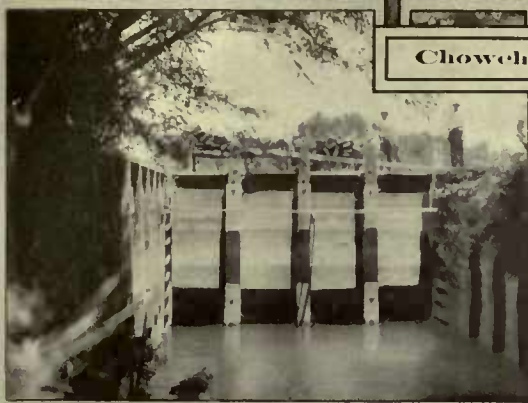








**Chowchilla Canal.**



REGULATOR GATE AT HEAD OF CANAL



VIEW ACROSS SAN JOAQUIN RIVER FROM HEADGATE



BRUSH DIVERSION WEIR, HEAD OF CANAL

**East Side Canal.**



HEADGATE, LOOKING DOWN CANAL



CHINESE IRRIGATION PUMP

**Madera Canal.**



FLUME ON ADOBE DITCH



OLD HEADGATE AND WASTE WEIR







## THE ALISO CANAL.

This canal belongs to Miller & Lux. Its water is used exclusively for the irrigation of wild grasses on lands belonging to that corporation. It has no dam or headgate; the bottom of the canal at its head was made lower than the bed of the San Joaquin, so that no dam or weir is necessary. Construction was begun in 1899, and the canal is not yet finished. It diverts water from the right bank of the river, in sec. 17, T. 13 S., R. 16 E., from which point it has been completed for a distance of 6 miles. It serves about 3,000 acres.

## THE CHOWCHILLA CANAL.

This canal is the property of the California Pastoral and Agricultural Company and Miller & Lux, and irrigates their lands, principally for the production of alfalfa, cereals, and wild grasses, and for the pasturage of cattle. It heads below Aliso Canal, in sec. 30, T. 13 S., R. 16 E., and uses Lone Willow Slough for the first 3 miles from the river. The length of the main canal is about 24 miles, with 14 miles of branches. The maximum capacity of the main canal is 120 cubic feet per second, and it serves on an average 8,380 acres each year. The canal was built in 1872, at a cost of \$120,000. No water is sold from this canal. It is in use throughout the year, excepting sometimes in August and September, when water is not available. This company made no formal appropriation of water, but holds its right by constant use since 1872. It is now in litigation with George D. Bliss and George D. Bliss, jr. (See Pl. XXIII.)

## THE BLYTH CANAL.

This canal is still farther down the river, on the same bank. It is a new construction, made in 1897. It has no dam or weir for diversion, and takes water from the river only in its highest stages. It is used exclusively to irrigate wild grass lands on Chowchilla Ranch, and is the property of the California Pastoral and Agricultural Company. It carries 400 cubic feet of water per second for 0.75 of a mile, and discharges it into the dry trough of the Fresno, where, by means of a series of six strong check levees, 4 to 6 feet high and 1 mile apart, the water is spread over the adjacent plains. About 9,000 acres of wild grass lands thus irrigated furnish pasturage for large herds of cattle. The cost of the canal was \$2,400, and that of the checks and levees in Fresno River was \$25,000.

## THE EAST SIDE CANAL.

This canal is sometimes called the Stevenson & Mitchell Canal. It diverts water from San Joaquin River in sec. 16, T. 9, R. 12 E., about 14 miles southwest of the town of Merced. Water is diverted by means of a temporary brush and sand-bag dam. Its length is about 20 miles. It has a capacity of 200 cubic feet per second, and irrigates a maximum area of 2,500 acres, mostly in wild grasses, alfalfa, and grains. It has six weirs along its length to govern the flow of the water, and also 36 waste gates to provide for the passage of drainage water that comes down the gulches running across the line of the canal. The canal was built in 1887-88, at a cost of \$80,000. A suit over water rights between this company and the San Joaquin and

Kings River Canal and Irrigation Company and Miller & Lux, a corporation, is now pending in the courts, and is discussed in this report under the head of litigation (page 245).

#### THE JAMES CANAL.

The James Canal Company is the successor to the Enterprise Canal and Irrigation Company. Their canal is the upper one on the left or southern bank of San Joaquin River, now in operation, and carries water upon the flat bottom lands of the valley in the region between San Joaquin River and Fresno Slough and on the south of the latter stream. It heads in San Joaquin River about 14 miles above its junction with Fresno Slough, and receives water only during high stages of the river. The main canal is 29 miles long and has 11 miles of branches. It carries 200 cubic feet of water per second, and has served a maximum area of 42,650 acres in grain, alfalfa, and grasses. Construction began in 1888, and the canal is not yet completed. The cost has been \$35,000. (See Pl. XXI.) This company is at present involved in litigation over water rights with the San Joaquin and Kings River Canal and Irrigation Company and Miller & Lux, a corporation, under the name of the Enterprise Canal and Land Company, and is enjoined by the court from making use of its canal. This litigation has already been discussed.

#### THE IRRIGATION SYSTEM OF THE SAN JOAQUIN AND KINGS RIVER CANAL AND IRRIGATION COMPANY.

This is the largest irrigation system on the river. (Pl. XXII.) It takes its water from that stream and from Fresno Slough, and by means of them supplies water to the other canals of the system lower down the valley, namely, the Outside Canal, the Parallel Canal, and the Dos Palos Colony Canal, and their branches. Just below the headgate of the "Old Canal" a fine new weir of the latest type has recently been constructed. On its southerly end is a gate or falling dam, which can be lowered flat on the bottom of the stream, thus permitting the passage of boats up and down the river. (Pl. XXI.) Some such arrangement is required, as the stream has been declared by the United States a navigable stream far above this point. The old, or main canal, was originally constructed with the idea of using it for navigation as well as for irrigation, but this stream was afterwards abandoned on the ground of expense of construction and operation. The main canal, built in 1872, heads in San Joaquin River at its junction with Fresno Slough (Pl. XXI), and follows down the valley on the west side of the river, for a distance of 76 miles, to a point opposite Westley, in Stanislaus County. The canal has a bottom width of 50 feet, a maximum depth of 6 feet, and a grade of 1 foot per mile. Its estimated capacity is 900 cubic feet per second. China Slough Canal diverts water from Fresno Slough about 1.5 miles above the head of the main canal (Pl. XXI), and empties into the main canal near its head. This canal has about the same dimensions as the main canal. It was constructed in 1897-98. Outside Canal takes water from the main canal on the west side about 2.5 miles below its head, and practically parallels the main canal, at a distance of about 1 mile, for 37 miles down the valley, to Los Banos Creek. It was constructed in 1896-97. Its bottom width is 50 feet, its depth 5 feet, and its grade 1 foot to 3 miles. The capacity is 350 cubic feet per second. Parallel Canal is taken out of the east bank



of the main canal 11 miles below its head and about 4 miles below Firebaugh. It follows the line of the main canal on the east side for a distance of 27.5 miles. It is 35 feet wide on the bottom, 4 feet deep, and has the same grade as the main canal—1 foot per mile. Dos Palos Colony Canal, built in 1878, takes water from the main canal on the east side 2 miles below the head of Parallel Canal. It is 11.04 miles long, has a bottom width of 40 feet, depth 5 feet, and runs on a grade of 1 foot per mile. It carries 790 cubic feet per second. Its water is distributed through four branches, 20, 16, 16, and 10 feet wide on the bottom, respectively, and each having a depth of 4 feet. The cost of the canal and its branches was \$26,500. The canals of the San Joaquin and Kings River Canal and Irrigation Company are used for the irrigation of grain, alfalfa, and wild grasses. The cost of the entire system of canals and branches was \$1,167,805. The company owns no lands other than its right of way, and sells its water to the farmers along the valley, and principally to Miller & Lux, who own the controlling interest in the company.

In direct connection with the system Miller & Lux use Poso Slough, Temple Slough, and Santa Rita Canal as means to take water from San Joaquin River to irrigate their own ranches and pasture lands in the "delta district" below the old canal, some 15 miles below its head.

This company and Miller & Lux have had, during the past few years, considerable litigation over water rights on San Joaquin River and over riparian rights as against rights by appropriation.

This completes the list of canals inspected by the writer which take water from the San Joaquin.

Recently Fresno and other cities of the upper valley have advocated the construction of a ship canal to follow in a general way the line of the river, Fresno Slough, and the lowest line of the valley, past Fresno, toward Bakersfield. It is said that the large canal companies have offered to cooperate in forwarding this scheme. Of course the United States Government would have a controlling voice in this matter as far as any interference with the navigability of the San Joaquin is concerned or affected. Nothing definite has as yet resulted from this proposition.

#### CANALS ON FRESNO RIVER.

There is but one system of canals deriving its water from Fresno River, namely, that owned by the Madera Canal and Irrigation Company. On this line, running through hilly and rocky country for a portion of its length, there are numerous rock cuttings and many flumes. The canal is usually "in cut" or excavation, and its structures are of the ordinary type. The company makes use of the bed of the river for a considerable distance as its main channel. The company irrigates the Adobe Ranch, about 10 miles easterly from the town of Madera, and some 10,000 or 15,000 acres of land in and near the Howard & Wilson Colony, southerly from the same town. The canal was built in 1873-74, at a cost which has been capitalized at \$400,000. (See Pl. XXIII.)

This company is in litigation over water rights with the San Joaquin and Kings River Canal and Irrigation Company and Miller & Lux, a corporation, and also with John H. Hite, of Mariposa County. These cases are discussed under the head of litigation.

**CANALS ON CHOWCHILLA CREEK.****THE SIERRA VISTA VINEYARD COMPANY.**

This company makes use of the bed of Chowchilla Creek, in the vicinity of Minturn, on the Southern Pacific Railroad, as a storage reservoir, by means of a dam built across the stream from bank to bank, and draws water from above it into the canals on either side of the creek. These irrigate orchards, vineyards, and alfalfa lands belonging to the company.

**BLISS CANAL.**

In a similar manner, lower down on the Chowchilla, George D. Bliss and George D. Bliss, jr., use two dams in the bed of that stream to fill small canals and irrigate several thousand acres of their ranch in that vicinity. They are engaged in litigation with the California Pastoral and Agricultural Company over riparian rights on Chowchilla Creek. This case is discussed under the head of litigation.

**DISTRIBUTION OF WATER AMONG CANALS.**

The waters of San Joaquin River are divided among the several canals, not by mutual agreement among the owners or by direction and control of any board having authority or any State official, but simply by being taken under the law prescribing the manner and method of appropriating waters for irrigation or other useful purposes.

No report of the progress of the proposed works nor of their completion is made or required subsequent to the time of recording the appropriation, nor of use of the water claimed at any time. The facts in the case must be ascertained, if at all, by private investigation. The difficulty of obtaining such information can not be appreciated except by one having made the attempt. This data is readily obtained from canal companies in actual operation, in so far as possessed by them, but is out of sight and out of reach in the many cases where records of appropriation have been made but the water not used.

The law places no limit upon the quantity of water which may be claimed in this manner. The statutes prescribing the method of appropriation lead to the condition of "first come, first served," but this is tempered by the necessity of actual use for some beneficial purpose and also by the vested rights of riparian owners.

The Chowchilla Canal, owned by the California Pastoral and Agricultural Company, has made no filing, but claims its rights by virtue of use since 1872. The maximum intake of the Chowchilla Canal is 120 cubic feet per second. With this exception all the canals and companies previously described base their claims for water from the streams enumerated upon claims filed, and, in some instances, upon riparian rights also.

No record of appropriation of water for the Aliso Canal has been discovered by the writer, and its claim is probably based upon the riparian rights of its owners, Miller & Lux.

The Blyth Canal has claimed for its use 1,000 cubic feet (per second?) under a 4-inch pressure. Its maximum intake is 400 cubic feet per second.

The East Side Canal Company claims 345,000 miner's inches under a 4-inch press-



ure, or 6,900 cubic feet per second. The maximum intake of the canal, claimed for it by its president, is 200 cubic feet per second.

The James Canal Company (formerly known as the Enterprise Canal and Land Company) claims 500,000 miner's inches, under a 4-inch pressure, or 10,000 cubic feet per second. The maximum flow claimed for this canal is 200 cubic feet per second.

The San Joaquin and Kings River Canal and Irrigation Company for its several canals claims from San Joaquin River and Fresno Slough, near the junction of the two streams, an aggregate of 165,000 miner's inches under a 4-inch pressure, or 3,300 cubic feet per second, and, in addition to this quantity, "all the water in the river" at Firebaugh. The maximum intake claimed for their canal is 1,400 cubic feet per second. In addition to these filings Miller & Lux claim their rights as riparian owners to an amount as yet indefinite and unadjudicated. They also use the waste and seepage waters from these canals and the flood waters of the river to fill Poso and Temple sloughs and Santa Rita Canal, for the irrigation of their own ranches in that district, and to flood their wild grass lands adjacent thereto. The maximum intake of all these canals, with the exception of the latter group belonging to Miller & Lux, amounts to 2,460 cubic feet per second, so that we see that on this river, whose mean delivery, according to the recorded gagings of it, is 2,448 cubic feet per second, we have claims made by the owners of canals now in operation aggregating 21,320 cubic feet per second plus "all the water in the river at Firebaugh" plus the riparian rights claimed by Miller & Lux plus the flood waters claimed for their ranches.

We see from this comparison that the mean flow of the river has apparently been reached by the actual consumption on the part of existing canals, and that the claims to water by the companies in actual operation are nearly ten times the amount of the mean flow. Evidently the irrigated area in this part of the State may be extended only by more skillful and economical use of the waters now available, and by extensive storage in the seasons of flood flow. The unfortunate lack in this State of a board of water administration, together with the existing loose laws relating to appropriations, naturally leads to such a condition of affairs as that above described, and to over-recurring litigation.

The Madera Canal and Irrigation Company is the only one taking water from the Fresno. According to the records of Fresno and Madera counties, it has filed on a total of 408,000 miner's inches, or 8,160 cubic feet of water per second. Of this quantity 6,000 miner's inches are claimed from Big Creek and 10,000 miner's inches from Raynor Creek, a natural tributary of Merced River. The flow of the river, as has been shown, at its greatest mean monthly discharge is 1,632 cubic feet per second, so that the amount claimed from this stream and its tributaries is five times the greatest mean monthly flow and nearly forty-nine times its annual mean flow of 167 cubic feet per second. The company claims a maximum intake for its canal of 800 cubic feet per second.

The Sierra Vista Vineyard Company has claimed, by record, from the waters of Chowchilla Creek 24,000 miner's inches, or 480 cubic feet per second.

The waters claimed by George D. Bliss and George D. Bliss, jr., for their dams and canals on Chowchilla Creek, below the Sierra Vista Vineyard Company, are 5,000 miner's inches plus the water rights of their predecessor, J. M. Montgomery, a record of whose claims the writer has been unable to discover.

**DISTRIBUTION OF WATER AMONG IRRIGATORS.**

In no one of the systems described is the water measured, but, when sold, is dealt out by the superintendent of the canal in amount sufficient to satisfy the irrigator, who is charged so much per acre irrigated. Both the company selling the water and the farmer buying it admit that the water would be used more wisely and economically if sold by measure, but each party to the contract objects to the measurement of water—the company on the ground that the measurement would take too much time and trouble, and the irrigator because he feels that he would not be treated as liberally as at present. The writer does not doubt that the sale of water by measurement would lead to a greatly improved system of conducting the water to the lands and applying it to them, as well as to much more skillful and economical use of it; and would, undoubtedly, greatly increase the duty of water in this district.

The water of the East Side Canal is almost exclusively used upon the Stevenson and Mitchell lands at its extremity. A small quantity is sold to farmers in the vicinity. Each farmer draws off the quantity that he believes his fields need, and pays for it in cash, the charge being \$2 per acre irrigated, or \$2.50 if the water is not contracted for before the 1st of January. The canals and gates are under the control of a superintendent, but all small irrigating ditches must be constructed by the farmers at their own expense.

The San Joaquin and Kings River Canal and Irrigation Company sells its waters to anyone wishing to purchase them. The public water rates of the company for the year of 1900 are as follows for any part or all the season between July 1 and the following June 30: For alfalfa, \$2.50 per acre; for cereals and corn, \$2 per acre; for orchards and vineyards, \$2.50 per acre; for market gardens, \$5 per acre; for water supplied between July 1 and September 1, for second crops of any kind except alfalfa, \$1 per acre. Lower rates than these have been established in Stanislaus County by the board of supervisors, but their authority in this respect is now being contested in the courts by the company.

The irrigation water from the San Joaquin and Kings River Canal and Irrigation Company is supplied upon the written request of the irrigator, and under the supervision of the canal superintendent; and is sold at so much per acre, the quantity supplied being sufficient to satisfy the irrigator.

The sale of water by the Madera Canal and Irrigation Company is conducted differently from that of the others. Water rights are sold to subscribers or stockholders at \$5 per acre. The owners of these rights then pay \$1 per acre per year for the use of the water. Nonstockholders pay \$1 per acre for the first irrigation of their land, and \$1.50 per acre for each subsequent irrigation. These latter rates for nonstockholders were ordered by the Madera County board of supervisors in 1898. A large number of nonstockholders, owning about 6,000 acres of land, take water at stockholders' rates as before stated, by virtue of the purchase originally of their land with water as an appurtenance thereto. This form of contract just described for water is not satisfactory, either to holders of water rights or to ordinary irrigators. The former complain of their obligation to pay \$5 per acre for each acre which they at first contracted to irrigate, whether afterwards they wished to irrigate it or not;



and also that the nonstockholders have been given better terms than they. The nonstockholders complain of a continued deficiency in the water supply.

The James Canal Company leases much of its land to farmers who divide the water among themselves, according to their needs, and pay for the use of the land and water with one-fourth of the crop which they produce. The water sold is not measured in any way.

The form of contract which seems most satisfactory to irrigators in the section of the State visited by the writer is the one which stipulates that, upon notice being given to the canal company, the latter will furnish the required amount of water upon being paid therefor at so much per acre. Other forms of contract more stringent in their exactions on the part of the canal companies are decidedly unpopular, and in some cases have the effect of preventing irrigation.

#### METHODS OF IRRIGATING.

The lands watered by means of the canals described in this report are remarkably well adapted to irrigation, usually being quite flat, with a uniform slope of 6 to 10 feet to the mile toward the bed of the river. From the main canals in the different systems the water is conducted through branches and laterals to small irrigation ditches upon the farm, where it is received by the irrigators, and applied to the lands under their direct supervision.

In the first days of irrigation in this region, large, high, rectangular check levees were used, but these were found to be not only expensive and very inconvenient for the passage of farm vehicles from one section to another, but also to require much time and a large amount of water to fill them. More recently the universal practice is to use low contour check levees, not more than a foot to eighteen inches in height, and from 10 to 20 feet on the base, enclosing an area of only 5 or 10 acres. These tracts are quickly and easily flooded. The levees do not interfere with the passage of wagons and mowing machines, and may even be plowed over and cultivated. The practice is to introduce the water upon the highest level, flood the area, keep the water moving along, and when a sufficient quantity in a check has been absorbed, to pass the remaining water on to the next and lower check. It is believed to be the best practice to keep the water flowing down and not allow it to stand long in any one area, as then it is more likely to bring alkali to the surface, and also to scald the grain. It is claimed that moving the water tends to leach the alkali from the soil.

In the case of the James Canal, the method of irrigation adopted is to flood with low contour checks, and, in some cases, when wetting pasture fields and wild grasses, to flood without the use of checks. The lands in this locality have a slight and uniform slope.

The Madera Canal and Irrigation Company applies water by the same method employed in the cases previously mentioned—that is, by means of low contour check levees and flooding for grain and alfalfa, and with small rectangular checks for orchards and vineyards, with occasionally the furrow system for the latter.

The Sierra Vista Vineyard Company applies its water to the lands by flooding in an older set of high rectangular check levees, and also in a later set of low small contour checks, this latter system having been adopted in place of the first, upon

extension of the irrigation area. The soil is a light sandy loam, quite fertile and favorable to irrigation.

In cases of orchards and vineyards planted on porous soils, lateral absorption, or furrow irrigation, is often practiced.

#### DUTY OF WATER.

Without an extended study of the results of irrigation from the various canals discussed in this report, it would be impossible to give an adequate treatment of the duty of water in the district covered. However, by drawing upon the experience of irrigators and canal owners, I was enabled to ascertain what it is considered to be in some instances.

The best accessible authorities give the duty of water on most of the canals under consideration to be approximately 160 acres to the cubic foot per second. This would apply to the Aliso Canal, the Chowchilla Canal, the Blyth canals, and the canals owned by the San Joaquin and Kings River Canal and Irrigation Company. On the Madera Canal and Irrigation Company's canal it is estimated to be from 100 to 120 acres per cubic foot per second. However, the loss of water from percolation into the bed of the river and into the distributing ditches is very large, estimated to be one-half of the whole amount taken in. Of course, if this loss could be prevented, the duty would be greatly increased, if not doubled. The largest duty found was on the land under the private canal of the Sierra Vista Vineyard Company. There it was roughly estimated by the proprietors to be 250 acres per cubic foot per second.

#### ANSWERS TO A CIRCULAR LETTER OF INQUIRY CONCERNING IRRIGATION MATTERS.

During the progress of my investigation of irrigation along San Joaquin River, I addressed a circular letter to many prominent citizens interested in irrigation, residents of Fresno, Madera, and adjacent territory, and, among other things, asked certain questions.

To these questions I received numerous answers, many oral and some written. I will endeavor to give the full sense of these replies:

(1) Is the present method of adjudicating water rights satisfactory? If not, what method should replace it? It was generally admitted that the present method of adjudicating water rights through the courts is very unsatisfactory. By many, a board of control, or a commission, with full power, was suggested.

(2) How has the doctrine of riparian rights influenced the success of irrigation in this State? And do you suggest any modifications of this doctrine? The unanimous opinion was that the doctrine of riparian rights has worked great hardship to irrigation, and that the law of riparian rights should be "entirely wiped out." Some suggested that the ownership of water should be vested in the State, or in the National Government.

(3) Is the present system of stream control, or lack of it, and of dividing the waters among the several claimants, satisfactory? If not, what form of control should be substituted for the present one? With a few exceptions, the answer was "No, it is not satisfactory, but very unsatisfactory;" and a system of control similar to that in the State of Wyoming was several times suggested.



(4) Should there be a State officer to be known as State engineer; and if so, what should be his powers and duties? Opinions seemed to be divided on this question; the majority, however, were in favor of such an officer, who should have power, under properly established principles of law, to adjudicate water rights.

(5) Should there be a central office of record for claims or appropriations of water, instead of the separate county records, as at present? This question was answered almost without exception in the affirmative; the county records, however, to be maintained as at present, and to be made complete as to the identifications of locality, quantity of water appropriated, its actual use, etc.

(6) What supervision or control should be exercised over water rights which yet remain to be acquired? The opinion was that few water rights now remain to be acquired; but that wherever they exist, they should be held by the State.

(7) As to what should be done to save to the fullest extent and to use the most economically and efficiently the waters at present running to waste, and particularly the flood waters, there was unanimous opinion that it is absolutely essential to the prosperity of the State that the waste and flood waters shall be saved by storage, and dealt out under proper control as needed. As to who should control this system of the conservation of water, the State or the nation, or the two combined, there seems to be no doubt that there should be such control, but some favored the State, some the nation, and some cooperative control by both.

(8) What legislation is needed to define rights to water and to stored water, and to determine the ownership of the waters thus stored? By whom should these laws be enacted, by the State or by the national legislature? Many citizens seemed to have very positive ideas with regard to needed legislation, and particularly as to the abolition of all riparian laws, saying, "That should be the first thing done;" but, as to the course and form of further legislation, either their ideas were not fully matured or else they declined to give them. Many did not favor national legislation on this subject.

### CONCLUSIONS.

As a result of my investigation and study of irrigation problems existing in California, and particularly as I have found them in the valley of San Joaquin River, I have drawn the following conclusions:

#### METHODS OF FILING AND RECORDING CLAIMS TO WATER.

The present method of posting notices and recording appropriations of water, under the existing State law previously referred to, is unsatisfactory to the last degree; in practice it results in great indefiniteness as to the amount of water claimed and uncertainty as to the locality mentioned. It countenances ignorance of water laws and water engineering, leads to obscurity of title, and, in many instances, renders the establishment of the validity and priority of claims almost impossible.

If the present method of making appropriations of water is to be retained, it should be reformed so that every record of appropriation of water shall be perfectly definite and accurate as to location, quantity of water claimed, date of appropriation, size and character of proposed diversion works, and place of use of the water. Also, reports of the time of beginning of the construction of works, of their progress and of their completion, should be exacted.

Periodical reports giving an account of the use of the water, of its amount, etc., should be required to be filed in the office of record, so that any person may at any time by consulting the records ascertain any essential fact relating to claim and use.

#### **ADJUDICATION OF WATER RIGHTS.**

The present method of adjudicating water rights in this State is very unsatisfactory. As a matter of fact, the only adjudication which may be had is by means of a suit in the courts. Nearly every decision of the superior court is appealed to the supreme court of the State, and several years time must elapse before a final and conclusive decision is obtained, and thousands of dollars must be expended. Often no new principle is established in this process, simply the relative rights of the contestants. The costs of such litigation have often been enormous. In two counties alone of this State it has been estimated by those well qualified to judge that from \$1,000,000 to \$2,000,000 have been expended in litigation over rights to water. So long is the necessary delay in the overburdened courts and so heavy the legal expense that many a claimant with limited means is debarred from maintaining his rights, and is forced to abandon their adjudication. Wealthy claimants, by prolonging contests and multiplying costs are sometimes enabled to "beat off" those who are apparently entitled to a decision in their favor.

In place of this chaotic condition of affairs, the writer would recommend that in so far as the constitution of the State will permit, legislation should be had to relieve the courts of this great burden of water litigation and to place the control of the streams of the State in the hands of an administrative board, which shall have authority to adjudicate, upon well-established principles of law, all water claims. The writer deems it essential that the decisions of this board of control shall be final.

#### **INFLUENCE OF THE DOCTRINE OF RIPARIAN RIGHTS ON THE SUCCESS OF IRRIGATION.**

The doctrine of riparian rights, as existing in this State, has exerted a most injurious influence on irrigation affairs. It has been the prolific source of litigation; has greatly interfered with and even debarred irrigation enterprises. The laws of the State of California clearly recognize the right to appropriate water from streams and lakes, as is shown by the sections of the statutes previously quoted. And in direct opposition of interest it maintains, under the common law, the riparian rights of private riparian proprietors, as evidenced by many consistent decisions of its supreme court.

The repeal of the doctrine of riparian rights, as construed by this court, affects and relates only to the streams and lakes wholly within the public lands of the United States or in those of the State. The riparian rights of private persons owning land on the banks of streams remain as they were before the passage of the repealing section before referred to; and all such must also, in the future, so remain during the existence of our present laws on the subject.

It seems to the writer, therefore, that the riparian doctrine has been abolished in this State in so far as it can be until all the water shall be again the property of the State or of the General Government, and that waters on a stream can be appropriated for use in irrigation only as subject to the riparian rights, if at all, on that stream.



**STREAM CONTROL.**

In reality there is at present no system of stream control in the State of California. Anyone who wishes may claim all the water of a stream he may see fit, and may proceed to take out as much as he likes until he arouses a contest with some other claimant, when immediately his case goes into court, to remain there perhaps for years. It can hardly be denied that this state of affairs is most unsatisfactory. In place of this there should be constituted a board of control, of the highest character and ability, which should adjudicate all existing claims to water, and have the authority to carry out its judgments. All water not covered by these adjudications should be declared to belong to the State, and should be controlled and divided for use by this board.

**STATE ENGINEER.**

The board should appoint a State officer, who might be designated as State engineer, of the highest scientific and technical ability, whose duty should consist in carrying out the rulings and decisions of the board in individual cases, such as deciding the validity of particular claims to water, dividing the waters of streams equably among claimants, etc.

**WHERE CLAIMS SHOULD BE RECORDED.**

If the records of appropriations of water, under the law therefor and as reformed according to my recommendation previously made, should be maintained, there should be not only the record in the office of the county recorder, but also a duplicate thereof in the record book in a central office, as for example that of the surveyor-general or the State engineer, for the convenience of the general public. In this way any person, as for instance a newcomer in the State, could find the exact status of any claim to water on any stream. The convenience of such duplicate record is obvious.

Such appropriations of water and all unappropriated waters of the State should be under the exclusive control of the administrative board previously mentioned. Progress reports of the initiation, prosecution, and progress of diversion works should be regularly made, both to the county and central offices, and annual or semiannual reports of the use of the water so diverted should be required. A lapse of a certain interval should automatically work the forfeiture of the claim. The before-mentioned board of control should, under the law, have the supervision and government in all matters of water rights.

**CONSERVATION AND USE OF FLOOD WATERS, AND LEGISLATION THEREON.**

For the same reason that the National Government takes control of its rivers and harbors and expends revenues in improving them for the purpose of facilitating navigation and commerce—that is, to benefit the country as a whole and all its citizens—should it assist and encourage the irrigation of all arid and semiarid public lands within our borders, thereby affording homes to our ever-growing population, and increasing the wealth and prosperity of the nation; and stimulating the basic industries agriculture and horticulture—the most important in every country. To this end it should preserve from sale or preemption all available sites for dams and storage



reservoirs situated upon public lands, and which may be utilized to irrigate such lands. As far as practicable the flood waters of the streams in arid or semiarid regions should be stored and used for irrigation. In this connection, ample protection should be extended to all forests at the heads of streams that they may forever remain the sources of perennial flow, equally free from overwhelming freshets and seasons of drought.

The National Government should also introduce, through its Agricultural Department, the most advanced and improved methods of irrigation, leading to the most skillful use of water, and to its greatest "duty," and, consequently, to the maximum productiveness of the soil of vast previously arid regions.

In cooperation with the National Government, the State should adopt a simple and effective law to govern the administration and use of all its waters, and the adjudication of all rights thereto acquired.

The common law doctrine of riparian rights seems to sufficiently protect private riparian owners and their use of water from streams, for all ordinary purposes, as for domestic use, milling, etc., with the exception of that of irrigation. And yet the use of water for irrigation in the arid States and Territories is the most important of all. But irrigation is unknown to common law, and legislation in this State is needed to encourage and protect that great and important use of water. The aim in this legislation should be, therefore, to benefit as largely as possible the agricultural population, without injuring the private rights of any riparian proprietors.

The fundamental idea in such legislation, in case the State does not see its way to the acquisition of all existing titles to its waters, is in the writer's opinion, to determine and decide authoritatively what quantity of water each riparian owner and irrigator along each stream is justly entitled to consume. Apparently, upon an equitable adjustment, each would be entitled to take the excess of water left over the just amounts belonging to the other claimants.

A State board of control, having a State engineer of its own appointment for its executive officer, should make such equitable adjustments, considering and fairly treating the claims of irrigators, and respecting the natural rights of riparian and nonriparian owners.













































































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